HYDAC INTERNATIONAL

Filter Systems

Fluid Condition Monitoring & Control

PN#02075860 / 12.11 / FSP1110-1386

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HYDAC About HYDAC

HYDAC stands for worldwide presence and accessibility to the customer. HYDAC has over 1000 distributors worldwide and more than 45 wholly owned branches. HYDAC has been active in the field of fluid condition monitoring and filtration for more than 45 years and is a global leader in the design and production of such products. From components to systems, HYDAC has for many years been supplying reliable products to all sectors of industry and, as an experienced partner, has supported its customers in the field of fluid service. Controlling contamination is crucial to fluid power systems — Let the experts at HYDAC help!

HYDAC Products

Our product range includes portable and online contamination monitors and water content sensors, as well as portable and permanent offline filters. For more critical applications, we offer in-depth analysis kits which return detailed reports about the condition of a system's fluid.

HYDAC Quality

HYDAC stands for quality and customer satisfaction. This quality is the result of constant research and development combined with 45 years of global application experience and know-how. Our products are designed to be reliable and cost-effective solutions for monitoring and maintaining hydraulic and lube oil cleanliness.

HYDAC Customer Service

Our internal staff and worldwide distribution network take care of the important matter of customer service. HYDAC values high standards, professional ethics, and mutual respect in all transactions with customers, vendors, and employees. We invest in our relationships by providing expertise, quality, dependability, and accessibility to foster growth and a sense of partnership. Our customer service representatives are committed to serving the customers' needs.

Power Generation

HYDAC Fluid Service Products play a key role in providing system maintenance and monitoring in power generation plants. By implementing a comprehensive filtration & fluid condition monitoring program these systems will operate more efficiently, and downtime and component failure will be reduced.

Mobile Market

Our rugged, portable contamination monitors allow easy field use to check oil cleanliness. OEM's use our products to verify and document that equipment is leaving the factory with clean oil. Our portable filtration units are ideal for correcting extreme water and contamination problems caused by the severe environments in which these machines operate.

Steel & Heavy Industry

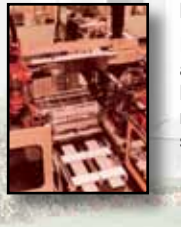
Maintaining clean hydraulic systems in steel mills and other heavy industrial plants is very important. The use of HYDAC fluid service products will help keep these operations running smoothly and efficiently, by reducing costly system and component failures. Investment in these products can easily be justified by the resulting cost savings.

Offshore Shipbuilding and Marine Technology

HYDAC offline filtration units protect the hydraulic systems of cranes, blow-out preventors, motion compensators, thruster and ballast controls, and riser tensioning systems on offshore drilling rigs. Our compact offline filter is available in an explosion proof *(intrinsically safe)* version, making it ideal for use in any industry where volatile gasses may be present.

Pulp and Paper

Lube oil circuits and hydraulic systems found in paper mills benefit greatly from the implementation of HYDAC fluid service products as well as HYDAC filters, coolers, accumulators, and other products. As with all industrial hydraulics and lube oil circuits, it is crucial to keep the levels of both water and solid contamination to a minimum.



Plastics

Injection molding and blow molding machines, are all perfect candidates for the supplemental filtration loops that HYDAC can help you install. When machine downtime is a problem, HYDAC's fluid service product are the solution!

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All information is subject to change without notice.

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Introduction

Contamination and degraded fluid quality cause inefficient operation, component wear, and eventually failures in all hydraulic and lubrication systems. The products in this catalog are the tools that are needed to prevent such occurrences. HYDAC Recommends a three step approach to controlling contamination in any system:

Assess

Recommend & Implement

Monitor & Maintain

Assess

Start by gathering complete information on the system. This includes:

- a list of the most critical components
- the mfg's recommended ISO class for each component
- the type of oil being used
- flow rate & operating pressure
- fluid temperature & ambient temperature
- system's operational characteristics
- details on all current filters in the system
- solid contamination levels *(ISO class)*
- water content levels
- details on all current filters in the system

Recommend & Implement

Next, specify your recommendations for upgrading the current filtration, and adding the appropriate supplementary filtration:

- pressure filters
- return line filters
- manifold cartridge/circuit protector filters
- element micron rating
- reservoir breathers or filler breathers
- strainer baskets
- addition of offline filtration loop
- use of portable filters for filling/temporary offline loops
- sufficient water removal protection
- proper fluid monitoring devices

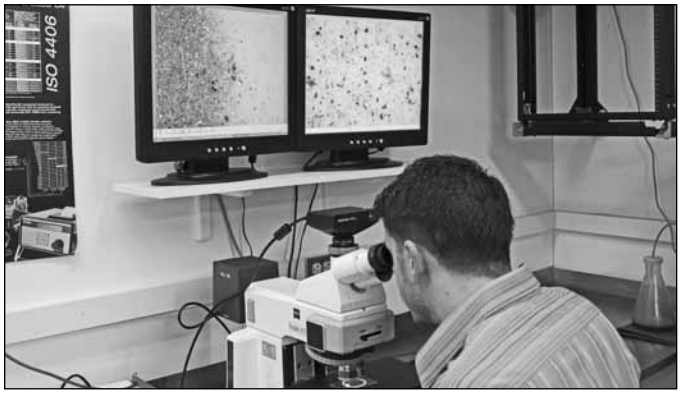
Monitor & Maintain

Finally, use reliable methods for continuous monitoring of the fluid conditions including:

- solid contamination
- water content
- additive depletion
- element clogging
- periodic detailed analysis of actual fluid samples
- portable filters for correcting unacceptable levels

The CS1000 contamination sensor mounted on a filter cart.

OLF 30 installation



Microscope with camera attached to a monitor

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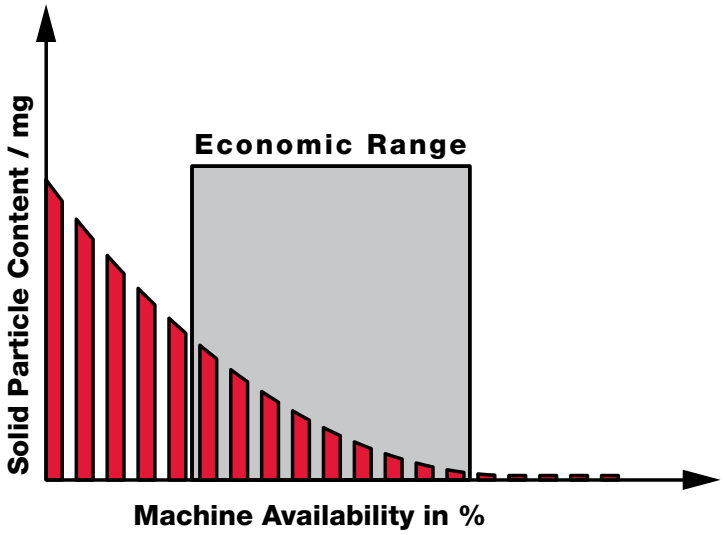
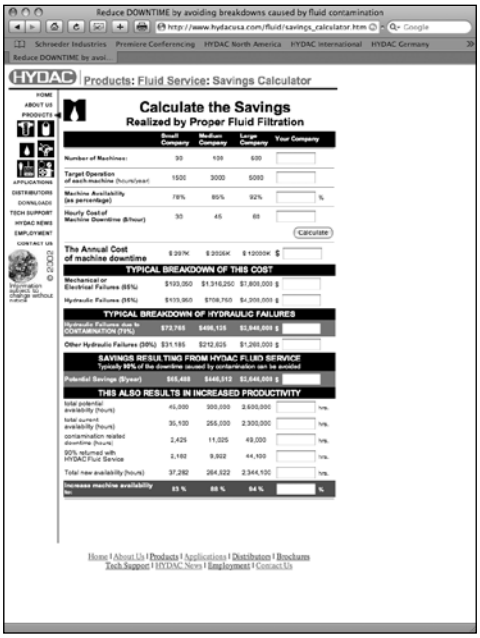
Savings Realized by Proper Contamination Control

The money invested in contamination control can easily be justified when the resulting machine availability increases significantly. The graph below illustrates that there is a range in which this investment really pays off.





Try our automated savings calculator at:

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Savings Calculation Example

This example demonstrates how to calculate the potential savings that will be realized by implementing a proper fluid service program.

	Example	Your Data
Number of Machines	50	a _____
Operating Hours per year	5,000	b _____
Current Availability	92%	c _____
Downtime Costs per hour	$60	d _____
Total Downtime Costs	$1,200,000	e _____ $(a \times b \times \frac{(100 - c)}{100} \times d)$
Downtime costs due to:		
- mechanical/electrical failures (65%)	$780,000	f _____ (e x .65)
- hydraulic failures (35%) of which:	$420,000	g _____ (e x .35)
- 70% is due to the fluid	$294,000	h _____ (g x .70)
- 30% is caused by other faults	$126,000	i _____ (g x .30)
HYDAC Fluid Service can return 90% of the fluid related downtime costs	**$264,600**	j _____ (h x .90)

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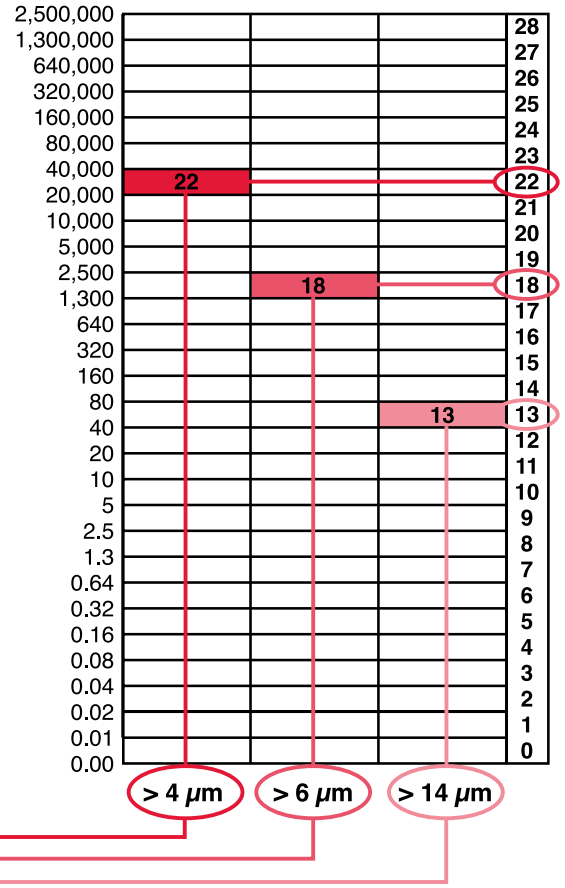
ISO 4406 Code

Cleanliness levels are defined by three numbers divided by slashes (/.) These numbers correspond to 4, 6, and 14 micron, in that order. Each number refers to an ISO Range Code, which is determined by the number of particles for that size (4,6, & 14µm) and larger present in 1 ml of fluid. Each range is double the range below. Refer to the chart below to see the actual ranges.

Example:

larger than 4µm = 22,340
larger than 6µm = 1,950
larger than 14µm = 43

ISO Code = 22 / 18 / 13



Achieving the appropriate cleanliness level in a system

The only way to achieve and maintain the appropriate cleanliness level in a hydraulic or lubrication system, is to implement a comprehensive filtration program. HYDAC offers all of the products that are needed to do just that! - They include:

Solid Contamination

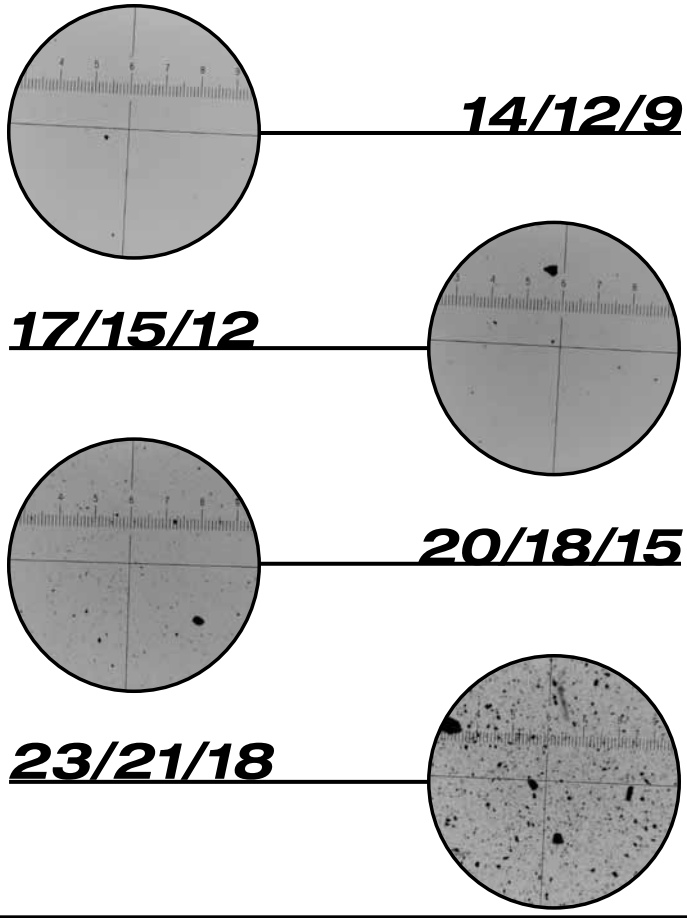
- pressure filters
- return line filters
- offline filtration loops
- oil transfer units for precleaning of new oil
- portable and online contamination monitors
- reservoir breathers and filler/breathers

Water Content

- water content sensors
- reservoir breathers with silica gel desiccant
- vacuum dehydration water removal units
- water removal elements

Fluid Analysis

- bottle sampling kits
- complete analysis kits



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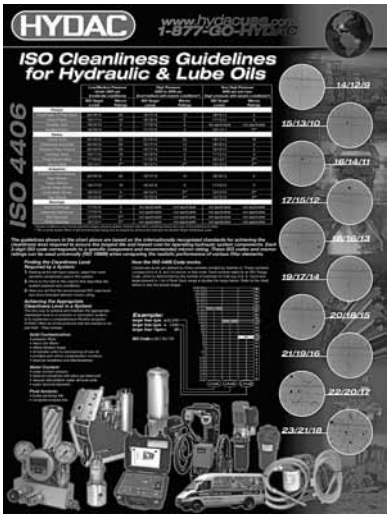
Finding the cleanliness level required by a system

1. Starting at the left hand column, select the most sensitive component used in the system.
2. Move to the right to the column that describes the system pressure and conditions.
3. Here you will find the recommended ISO class level, and recommended element micron rating.

	Low/Medium Pressure Under 2000 psi (moderate conditions)		High Pressure 2000 to 2999 psi (low/medium with severe conditions[1])		Very High Pressure 3000 psi and over (high pressure with severe conditions[1])	
	ISO Target Levels	Micron Ratings	ISO Target Levels	Micron Ratings	ISO Target Levels	Micron Ratings
Pumps						
Fixed Gear or Fixed Vane	20/18/15	20	19/17/14	10	18/16/13	5
Fixed Piston	19/17/14	10	18/16/13	5	17/15/12	3
Variable Vane	18/16/13	5	17/15/12	3	not applicable	not applicable
Variable Piston	18/16/13	5	17/15/12	3	16/14/11	3[2]
Valves						
Check Valve	20/18/15	20	20/18/15	20	19/17/14	10
Directional (solenoid)	20/18/15	20	19/17/14	10	18/16/13	5
Standard Flow Control	20/18/15	20	19/17/14	10	18/16/13	5
Cartridge Valve	19/17/14	10	18/16/13	5	17/15/12	3
Proportional Valve	17/15/12	3	17/15/12	3	16/14/11	3[2]
Servo Valve	16/14/11	3[2]	16/14/11	3[2]	15/13/10	3[2]
Actuators						
Cylinders, Vane Motors, Gear Motors	20/18/15	20	19/17/14	10	18/16/13	5
Piston Motors, Swash Plate Motors	19/17/14	10	18/16/13	5	17/15/12	3
Hydrostatic Drives	16/15/12	3	16/14/11	3[2]	15/13/10	3[2]
Test Stands	15/13/10	3[2]	15/13/10	3[2]	15/13/10	3[2]
Bearings						
Journal Bearings	17/15/12	3	not applicable	not applicable	not applicable	not applicable
Industrial Gearboxes	17/15/12	3	not applicable	not applicable	not applicable	not applicable
Ball Bearings	15/13/10	3[2]	not applicable	not applicable	not applicable	not applicable
Roller Bearings	16/14/11	3[2]	not applicable	not applicable	not applicable	not applicable

1. Severe conditions may include high flow surges, pressure spikes, frequent cold starts, extremely heavy duty use, or the presence of water
2. Two or more system filters of the recommended rating may be required to achieve and maintain the desired Target Cleanliness Level.



FREE Poster!

The information on these two pages is also available on our **ISO Cleanliness Guidelines** poster.

Visit our web site to request your FREE copy.

www.HYDACusa.com/**poster**

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CS 1000 Series
Contamination Sensor

CS 1000 with Block Kit

CS 1000 without display

CS 1000 with display

Description

The CS 1000 Contamination Sensor is the latest HYDAC development for continuous measurement of solid contamination of fluids.

Using the latest technology and materials, the CS 1000 is a reliable measuring instrument that is permanently mounted on your mobile or industrial equipment.

The attractive cost-to-performance ratio makes it especially interesting for OEM applications. Online, real-time condition monitoring allows you to have total predictive maintenance.

Applications

Monitoring system on vehicles such as

- Construction equipment
- Agricultural machinery
- Mobile and stationary mining equipment

Industrial hydraulic systems

- Integration into power unit monitoring systems
- Hydraulic test stands

Combination with filter unit

CS 1000 Block KIT

The Contamination Sensor Block KIT *(CS 1000 Block KIT)* combines two condition monitoring products, the CS 1000 series *(Contamination Sensor)* and the AS 1000 series *(Aqua Sensor)* into one plug and play unit. It serves as an on-line measurement of solid contamination and water in hydraulic and lube systems.

Note: Flow control is necessary when utilizing the CS 1000 sensor. Flow must be maintained through the sensor module to ensure accurate readings. Utilization of the CS Block Kit is required to maintain Sensor flow rate range as described in the Technical Details *(at the right)*.

Features

- Version with or without display
- Display with pivot-function
- Display with 6-digit ISO Code *(optional)*
- Measurement of solid particle contamination in hydraulic and lubricating fluids
- Compact and rugged design
- Type of protection IP67
- Max. pressure 4350 psi (300 bar)
- Max. viscosity 4635 SUS
- Voltage supply 9 - 36VDC
- Data output 4 - 20mA or 0 - 10 VDC

Technical Details

Self-diagnosis	Continuously with error indication via status LED
Measuring range	Display up to class ISO 7/6/5 to 28/27/26 Calibration within the range ISO 13/11/10 to 23/21/18
Contamination code	ISO 4406 : 1999 SAE AS 4059 (D)
Operation pressure	4350 psi (300 bar) max
Connectors Inlet Outlet	 Thread G 1/4, ISO 228 Thread G 1/4, ISO 228
Sensor flow rate	30 - 300 ml/min (300 ml = ~10 oz)
Permissible viscosity range	15 - 4635 SUS (1 - 1000 cSt)
Fluid temperature range	32° to 185°F (0° to 85°C)
Power supply voltage	9 - 36 VDC, residual ripple < 10%
Power consumption	3 Watt maximum
Electrical specification 4 to 20 mA output: 0 to 10 V output:	 Max. 330 Ω Min. 820 Ω Max. current 1.5 A
Electrical outputs Analog Interfaces Limit Switching Output RS485	 4 to 20 mA (max 330 Ω) 0 to 10 VDC (min 820 Ω) Passive, n-switching power MOSFET, max current 1.5A 2 conductor cable
Ambient temperature range	-22° to 176°F (-30° to 80°C)
Relative Humidity	max. 95%, non-condensing
Seal Material Hydraulic/Mineral Oil Phosphate Ester	 Fluoro-elastomer (FPM) Ethylene Propylene (EPDM)
Electrical safety class	III *(low voltage protection)*
IP class	IP67
Weight	2.9 lbs. (1.3 kg)

We do not guarantee the accuracy or completeness of this information. The information is based on average working condition. For exceptional operating conditions please contact our technical department. All details are subject to technical changes.

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Model Code

CS 1 2 2 0 - A - 0 - 0 - 0 - 0 / - 000

Series
CS = Contamination Sensor

Resolution
1 = 4 Particle Size Channels

Indicator Code
2 = ISO 4406 : 1999; SAE AS 4059 (D)
>4 µm(c) >6 µm(c) >14 µm(c) >21 µm(c)
3 = ISO 4406 : 1987; NAS 1638
>2 µm >5 µm >15 µm >25 µm
ISO 4406 : 1999; SAE AS 4059 (D)
>4 µm(c) >6 µm(c) >14 µm(c) >21 µm(c)

Options
1 = without Display
2 = with Display *(270° rotation of display)*

Fluids
0 = Hydraulic/Mineral oil
1 = Phosphate Esters

Analog Interfaces
A = 4 to 20 mA
B = 0 to 10 V

Switching Output
0 = Limit Switching Output

Digital Interfaces
0 = RS485

Electrical Connection
0 = Plug M12x1, 8-pole *(connection cable not included)*

Mounting
0 = Inline version *(vertical flow mounting is recommended)*
1 = Flanged version

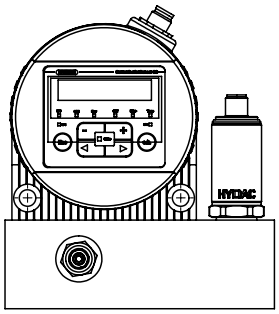
Modification Number
000 = standard
K = CS Block Kit without AS Sensor *(requires Mounting Option 1)*
KAS = CS Block Kit with AS Sensor *(requires Mounting Option 1)*

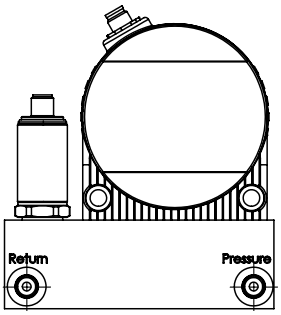
Scope Of Delivery
- Contamination sensor
- Operation and Instruction manual
- Calibration Certificate

Accessories
- Connection cable 6.5 ft. with M12x1 connector, screened 8-pole: Part Number 03281220
- Connection cable 16.4 ft. with M12x1 connector, screened 8-pole: Part Number 02702459
- Connection cable 9.8 ft. with M12x1 connector, 8-pole: Part Number 02091414
- CSI-D-5 Contamination Sensor Interface: Part Number 03249563
- Power Supply-CS1XXX-PS1: Part Number 03376530

Model Codes Containing RED are non-standard items – Minimum quantities and longer lead times may apply - Contact HYDAC for information and availablity

CS 1000 Block Kit





Quick Order Guide

Model Code	Part Number	Description
CS1220-A-0-0-0-0 /-000	03236362	4-20mA display model
CS1210-A-0-0-0-0 /-000	03240458	4-20mA non-display model
Connection Cable	03281220	6.5 foot
CS1220-A-0-0-0-1 / K	02087348	4-20mA display model and CS Block Kit without AS Sensor
CS1220-A-0-0-0-1 / KAS	02086855	4-20mA display model and CS Block Kit with AS Sensor

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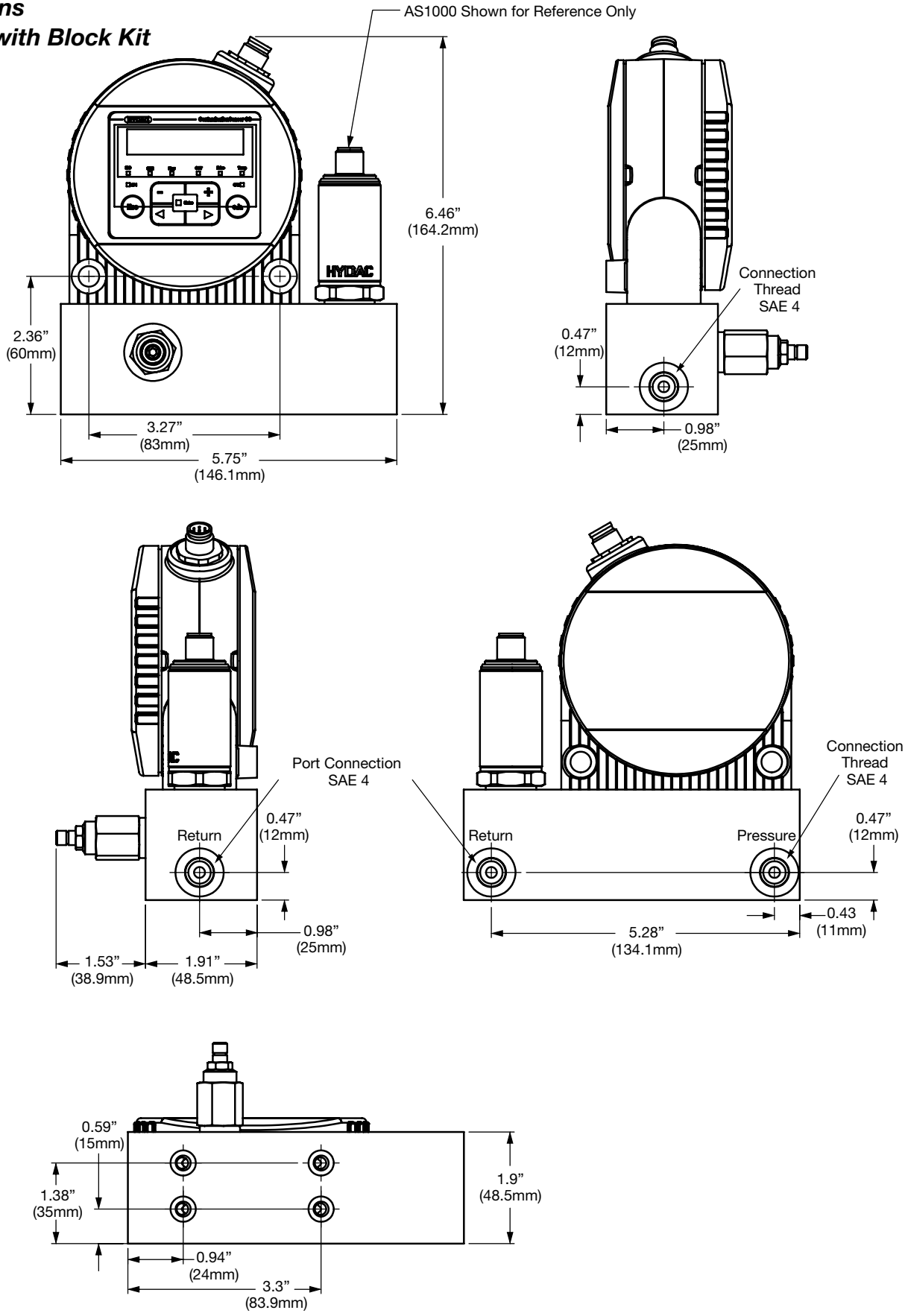
Dimensions
CS 1000 with Block Kit



Dimensions are for general information only, all critical dimensions should be verified by requesting a certified print.

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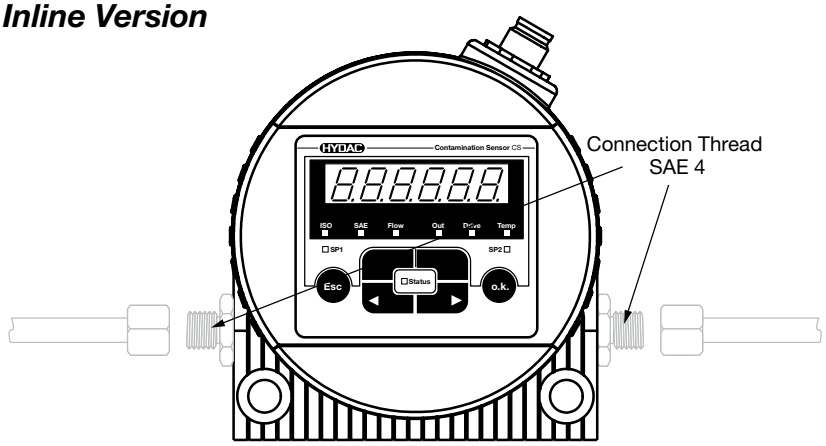
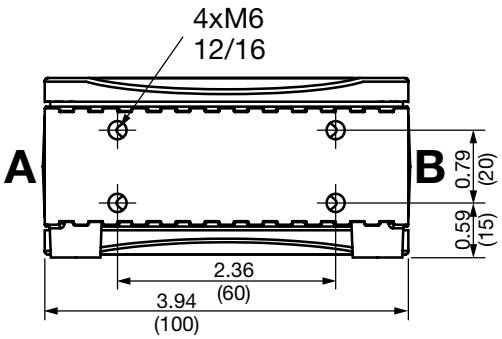
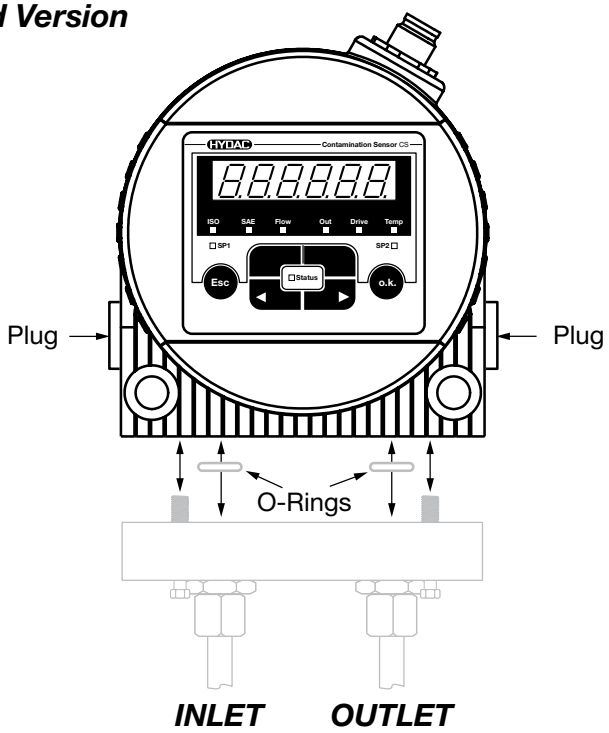
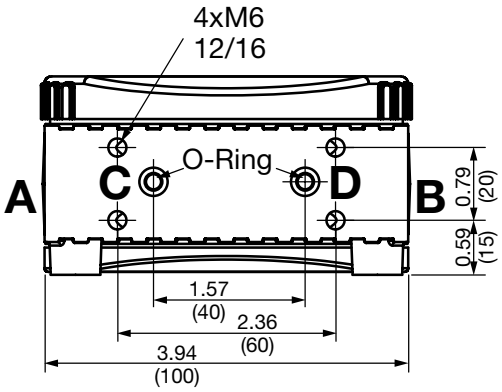
Hydraulic Connections
Inline Version



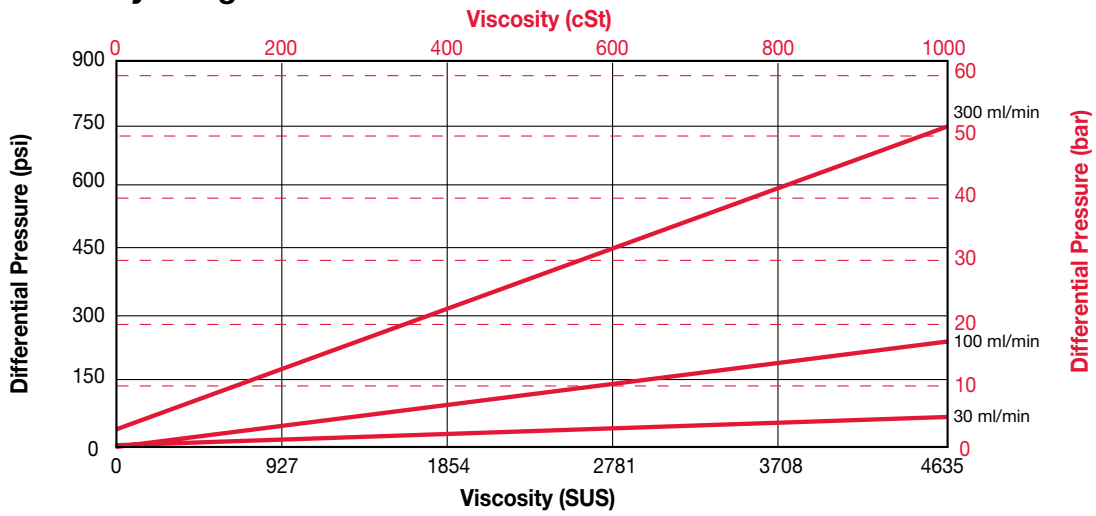


Flanged Version





Pressure - Viscosity Range



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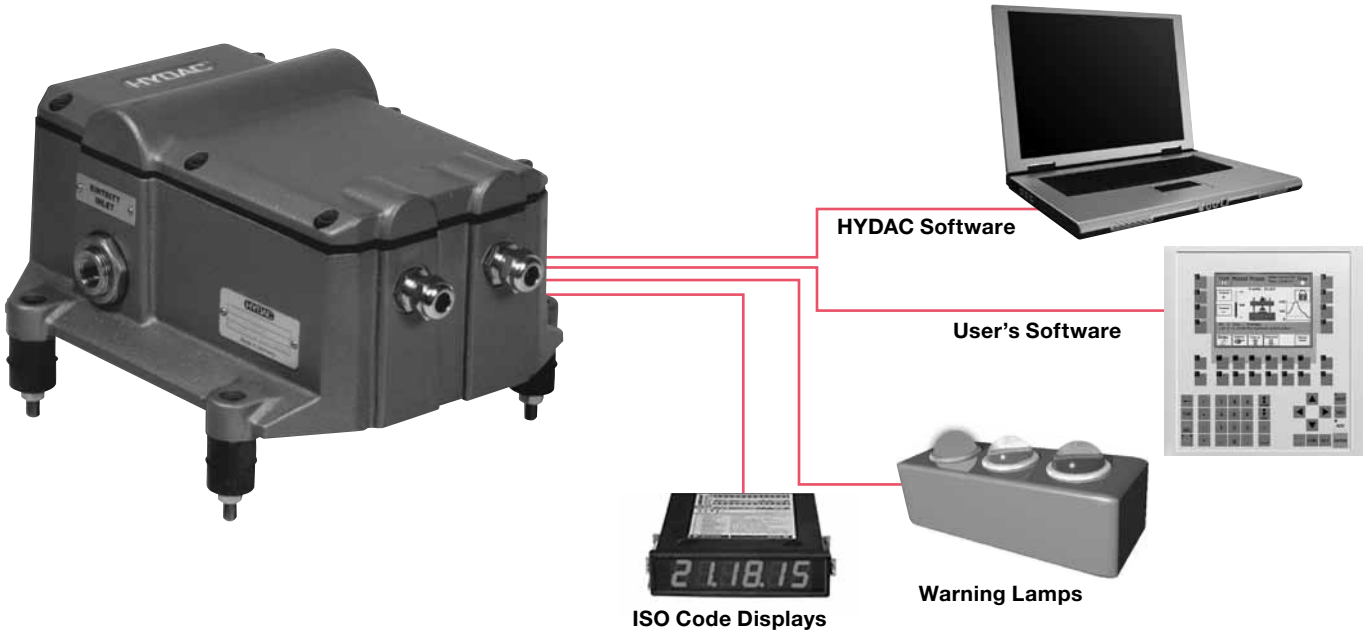
CS 2000 Series
Contamination Sensors



Description

The CS Contamination Sensor is a solid contamination sensor for detecting and monitoring solid contamination in hydraulic, lube and fuel oil. The CS Sensor continuously monitors the condition of the fluid and transmits the information to a variety of devices in real-time!

The data can be transmitted in various formats, allowing the user to display contamination levels, program alarms and/or warnings, activate or de-activate auxiliary filtration loops, or examine via HYDAC software.

The Sensor technology used is the same as that in our portable FCU series contamination monitors and has been proven as a successful means of detecting solid contamination particles.

The HYDAC sensor concept provides a distinct durability advantage. The CS Sensor is not sensitive to vibration, optical system contamination, pressure pulsations, fluid color, turbidity, or continuous high fluid temperatures.

Applications

This unit can be applied to any hydraulic system in which contamination monitoring is critical. It is designed for permanent installation in the system. Common applications of the CS Sensor Include:

- Lube-oil systems
- Paper mills
- Power generation plants
- Steel mills
- Flushing Process Control
- Fuel oil systems

Features

- Online installation
  (pressures up to 5000 psi w/ external relief)
- 4-bolt cushioned mounting
- Weight - 8.8 lbs (4 kg)

Data Output To

- PC - via HYDAC software *(included)*
- Programmable logic controllers *(PLC)*
- Warning lamps via relays
- Local ISO class display *(customer supplied)*
- 4 to 20mA or DIN-Messbus or Ethernet

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Model Code

CS 21 3 0 - 1 - U / - 1 - 2

Series
CS = Contamination Sensor

Model
21 = 3 digit ISO 4406 Code (>2/>5/>15)
22 = 3 digit ISO 4406 Code (>4/>6/>14)

Enclosure
3 = Stationary

Fluids
0 = Standard mineral fluids and mineral based synthetics
1 = Phosphate esters *(e.g. Skydrol, Hyjet)*

Modification Number
1 = Standard

Supply Voltage
U = 24 VDC

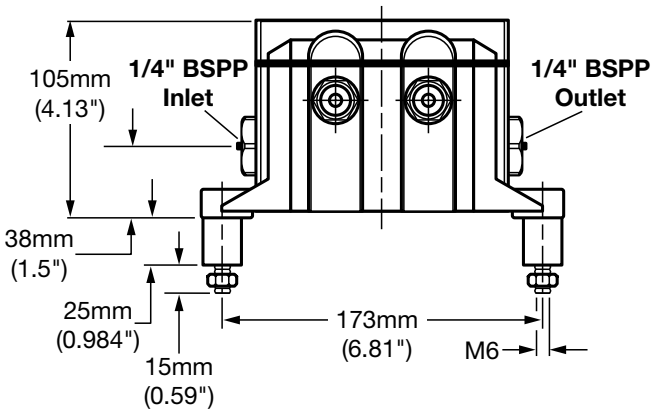
Pressure Range
1 = 280-560 psi *(for pressures from 560 to 5000 psi see below*)*
2 = 70-210 psi
3 = 28-140 psi

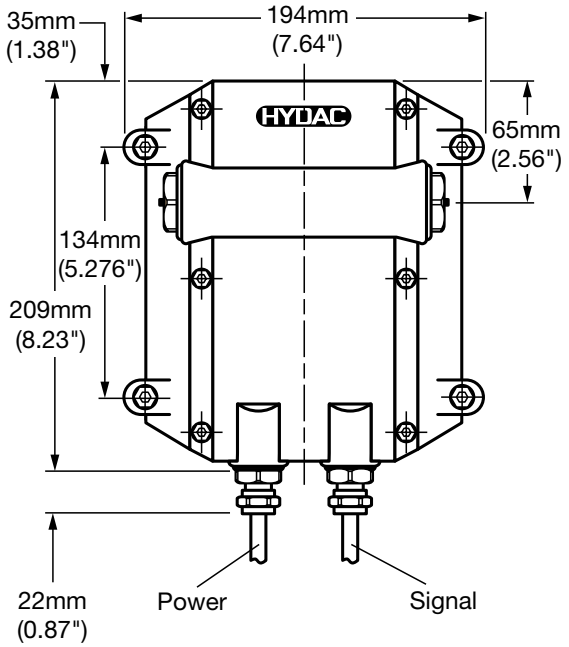
Output
0 = RS232 *(DIN-66348 protocol) (enables easy communication with Hydac CoCoS Software)*
1 = 4 - 20 mA
2 = DIN-Messbus *(enables communication with HYDAC software)*
X = Other

* For pressures above 560 psi - Reduce the pressure to between 280 and 560 psi. Please contact HYDAC for details.

Model Codes Containing RED are non-standard items – Minimum quantities and longer lead times may apply - Contact HYDAC for information and availablity

Dimensions





Dimensions are for general information only, all critical dimensions should be verified by requesting a certified print.

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CSM 1000 Series
Contamination Sensor Module

CSM 1000 Installation in Systems

Basically there are four different possibilities for connecting the CSM 1000 to hydraulic and lubrication systems. Select the measuring point according to the type of information the customer requires from the system.

1. Measuring from tank

Indicates the overall condition of the oil. Inlet and outlet of the CSM are connected to the tank near the suction of the main pump.

2. Measuring from the pressure line before the filter

This is the normal location for taking bottle samples. By using the CSM 1000 the amount of bottle sampling can be reduced and information on the oil condition is therefore available immediately. This test point is used mostly in lube systems

3. Measuring from pressure line after the filter

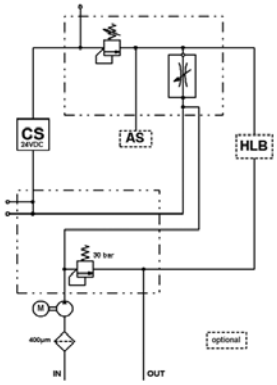
This test point is used in roll hydraulics and the reason for measuring oil after the filter is to ensure that clean oil is always available to the sensitive proportional valves and to other machine parts. Mainly used in roll hydraulics and particularly if customers have had problems with the proportional valves.

Important! The pressure should be reduced using a separate valve before the oil goes into the CSM.

Applications

- Lubrication systems in paper, steel and energy sectors
- Preventive, pro-active preparation of service/intervals
- Monitoring of component cleanliness on test benches
- Monitoring of oil cleanliness in storage tanks

Hydraulic Circuit



Technical Details

Pump type	Gear pump
Operation pressure	
P_{in} *(INLET)*	-0.4 to 0.5 bar *(standard pump)* -0.4 to 120 bar *(pump, pressure inlet stable)*
P_{out} *(OUTLET)*	5 bar
P_{out} *(leakage line)*	0.5 bar *(pump, pressure inlet stable)*
Permissible outlet pressure	5 bar max
Connections	INLET: Thread G 1/4, ISO 228 OUTLET: Thread G 1/4, ISO 228
Total flow rate	approx. 100 ml/min *(standard pump)* approx. 180 ml/min *(pump, pressure inlet stable)*
Permissible operating viscosity range	10 to 3000 cSt
Permissible viscosity range for measuring	10 to 1000 cSt
Permissible Fluid temperature range	32° to 158°F (0° to 70°C)
Permissible fluids	Hydraulic and lubrication fluids based on mineral oil
Power consumption *(motor pump group)*	0.18 kW @ 50 Hz 0.21 kW @ 60 Hz
Ambient temperature range	32 to 131°F (0° to 55°C)
Storage temperature range	-4 to 185°F(-20 to 85°C)
Relative humidity	max. 90%, not condensing
IP class	IP55
Weight	approx. 40 lbs (18 kg)
ContaminationSensor	
Self-diagnosis	continuously with error indication via status LED
Measuring range	MIN / MAX Display from class ISO 7/6/5 (MIN) up to class ISO 28/27/26 (MAX) Calibrated within the range ISO 13/11/10 to ISO 23/21/18.
Power supply voltage	9 to 36 VDC, residual ripple <10%
Power consumption	3 Watt max
Electrical outputs	- Analog output 4 to 20 mA or 0 to 10 V - RS485 Interface - Switching output

www.comoso.com

Model Code

CSM 1 2 2 0 - 1 - 1 - W/N/X60/O60 -

Series
CSM = ContaminationSensor Module

Resolution ContaminationSensor
1 = 4 particle size channels

Contamination Codes
2 = ISO 4406:1999; SAE AS 4059 (D) / > 4 µm(c) > 6 µm(c) > 14 µm(c) > 21 µm(c)
3 = ISO 4406:1987; NAS 1638 / > 2 µm > 5 µm > 15 µm > 25 µm
ISO 4406:1999; SAE AS 4059 (D) / > 4 µm(c) > 6 µm(c) > 14 µm(c) > 21 µm(c) reversible

Options
1 = without display
2 = with display *(display rotation of 270°)*

Fluids
0 = based on mineral oil

Hydraulic Version
1 = Standard pump
2 = Pump, pressure inlet stable, with oil leakage pipe

Electrical Output ContaminationSensor
1 = 4 to 20 mA analogue output
2 = 0 to 10 V analogue output

Supply Voltage Motor Pump Unit
W/N/X60/O60 = 230 V, 50 Hz, 3Ph/ 265 V, 60 Hz, 3Ph, delta connection
400 V, 50 Hz, 3Ph/ 460 V, 60 Hz, 3Ph, star connection
N/AB/N60/AB60 = 400 V, 50 Hz, 3Ph/ 400 V, 60 Hz, 3Ph, delta connection
690 V, 50 Hz, 3Ph/ 690 V, 60 Hz, 3Ph, star connection

Supplementary Details
AS = with AquaSensor AS 1000 Series

Items Supplied:

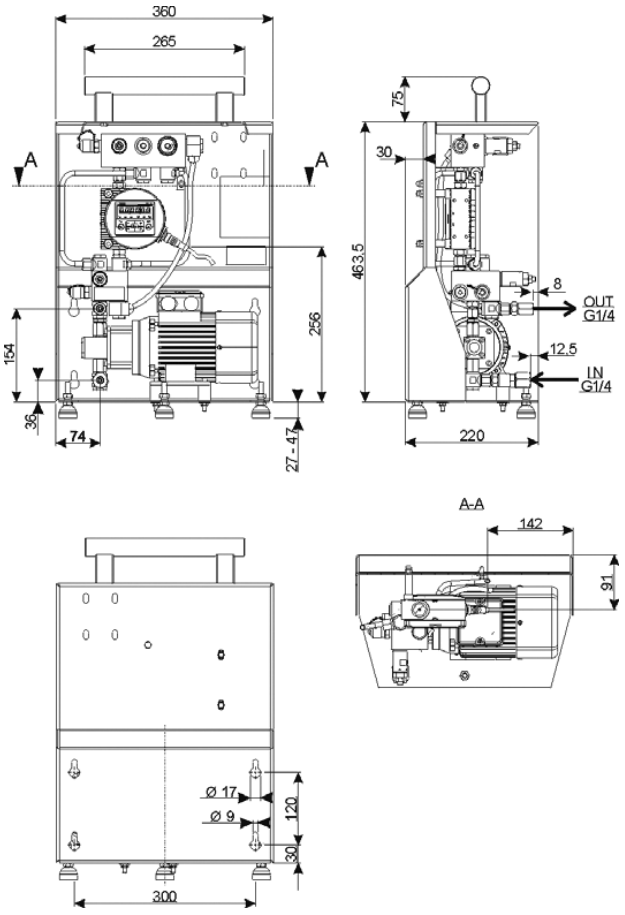
- CSM
- Operating and Maintenance Instructions
- CD with CoCoS 1000 Software and manuals
- Calibration Certficate ContaminationSensor

Model Codes Containing RED are non-standard items – Minimum quantities and longer lead times may apply - Contact HYDAC for information and availablity

Accessories for

CS 1000	Part No.
ContaminationControl Software CoCoS 1000	03251484
ContaminationSensor Interface CSI-D-5	03249563
Connector with 2 m cable, screened, 8-pole, M12x1	03281220
Connector with 5 m cable, screened, 8-pole, M12x1	02702459
Extension cable 5 m, socket 8-pole, M12x1 / plug 8-pole, M12x1	03281240
Connector with screw clamp, screened, 8-pole, M12x1	03281243
AS 1000 ®	**Part No.**
ZBE 08 Right-angled connector, 5 pole, M12x1	06006786
ZBE 08S-02 Right-angled connector, with 2 m cable, screened, 5 pole, M12x1	06019455
ZBE 08S-05 Right-angled connector with 5 m cable, screened, 5 pole, M12x1	06019456
ZBE 08S-10 Right-angled connector with 10 m cable, screened, 5 pole, M12x1	06023102

Dimensions



Dimensions are millimeters and for general information only, all critical dimensions should be verified by requesting a certified print.

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CSM 2000 Series
Contamination Sensor Module

CSM 2000 Installation in Systems

Basically there are four different possibilities for connecting the CSM 2000 to hydraulic and lubrication systems. Select the measuring point according to the type of information the customer requires from the system.

1. Measuring from tank

Indicates the overall condition of the oil. Inlet and outlet of the CSM are connected to the tank near the suction of the main pump.

2. Measuring from the pressure line before the filter

This is the normal location for taking bottle samples. By using the CSM 2000 the amount of bottle sampling can be reduced and information on the oil condition is therefore available immediately. This test point is used mostly in lube systems

3. Measuring from pressure line after the filter

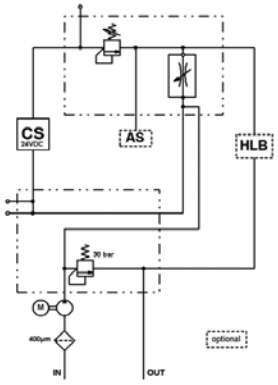
This test point is used in roll hydraulics and the reason for measuring oil after the filter is to ensure that clean oil is always available to the sensitive proportional valves and to other machine parts. Mainly used in roll hydraulics and particularly if customers have had problems with the proportional valves.

Important! The pressure should be reduced using a separate valve before the oil goes into the CSM.

Applications

- Lubrication systems in paper, steel and energy sectors
- Preventive, pro-active preparation of service Intervals
- Monitoring of component cleanliness on test benches
- Monitoring of oil cleanliness in storage tanks

Hydraulic Circuit



Technical Details

Pump type	Gear pump
Operation pressure	
P_{in} *(INLET)*	-0.4 to 0.5 bar *(standard pump)* -0.4 to 120 bar *(pump, pressure inlet stable)*
P_{out} *(OUTLET)*	5 bar
P_{out} *(leakage line)*	0.5 bar *(pump, pressure inlet stable)*
Permissible outlet pressure	5 bar max
Connections	INLET: Thread G 1/4, ISO 228 OUTLET: Thread G 1/4, ISO 228
Total flow rate	approx. 100 ml/min *(standard pump)* approx. 180 ml/min *(pump, pressure inlet stable)*
Permissible operating viscosity range	10 to 3000 cSt
Permissible viscosity range for measuring	10 to 1000 cSt
Permissible Fluid temperature range	32° to 158°F (0° to 70°C)
Permissible fluids	Hydraulic and lubrication fluids based on mineral oil
Power consumption *(motor pump group)*	0.18 kW @ 50 Hz 0.21 kW @ 60 Hz
Ambient temperature range	32 to 131°F (0° to 55°C)
Storage temperature range	-4 to 185°F (-20 to 85°C)
Relative humidity	max. 90%, not condensing
IP class	IP55
Weight	approx. 40 lbs (18 kg)
ContaminationSensor	
Self-diagnosis	continuously with error indication via status LED
Measuring range	MIN / MAX Display from class ISO 7/6/5 (MIN) up to class ISO 28/27/26 (MAX) Calibrated within the range ISO 13/11/10 to ISO 23/21/18.
Power supply voltage	9 to 36 VDC, residual ripple <10%
Power consumption	3 Watt max
Electrical outputs	- Analog output 4 to 20 mA or 0 to 10 V - RS485 Interface - Switching output

www.comoso.com

Model Code

CSM 2 2 3 0 - 1 - 1 - W/N/X60/O60 -

Series
CSM = ContaminationSensor Module

Resolution ContaminationSensor
2 = 4 particle size channels

Contamination Codes
2 = ISO 4406:1999; SAE AS 4059 (D) / > 4 µm(c) > 6 µm(c) > 14 µm(c) > 21 µm(c)
3 = ISO 4406:1987; NAS 1638 / > 2 µm > 5 µm > 15 µm > 25 µm
ISO 4406:1999; SAE AS 4059 (D) / > 4 µm(c) > 6 µm(c) > 14 µm(c) > 21 µm(c)
reversible

Contamination Sensor
3 = Standard

Fluids
0 = based on mineral oil

Hydraulic Version
1 = Standard pump

Electrical Output ContaminationSensor
1 = 4 to 20 mA analogue output
2 = 0 to 10 V analogue output

Supply Voltage Motor Pump Unit
W/N/X60/O60 = 230 V, 50 Hz, 3Ph/ 265 V, 60 Hz, 3Ph, delta connection
400 V, 50 Hz, 3Ph/ 460 V, 60 Hz, 3Ph, star connection
N/AB/N60/AB60 = 400 V, 50 Hz, 3Ph/ 400 V, 60 Hz, 3Ph, delta connection
690 V, 50 Hz, 3Ph/ 690 V, 60 Hz, 3Ph, star connection

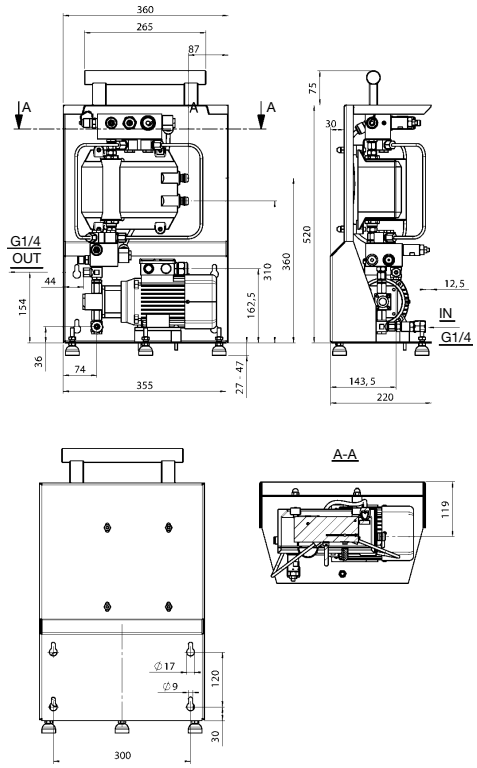
Options
AS = with AquaSensor AS 1000 Series

Items Supplied:

- CSM
- Operating and Maintenance Instructions
- CD with CoCoS 1000 Software and manuals
- Calibration Certficate ContaminationSensor

Model Codes Containing RED are non-standard items – Minimum quantities and longer lead times may apply - Contact HYDAC for information and availablity

Dimensions



Accessories for:

CS 2000	Part No.
ContaminationControl Software CoCoS 1000	03251484
ContaminationSensor Interface CSI-D-5	03249563
Connector with 2 m cable, screened, 8-pole, M12x1	03281220
Connector with 5 m cable, screened, 8-pole, M12x1	02702459
Extension cable 5 m, socket 8-pole, M12x1 / plug 8-pole, M12x1	03281240
Connector with screw clamp, screened, 8-pole, M12x1	03281243
AS 1000	**Part No.**
ZBE 08 Right-angled connector, 5 pole, M12x1	06006786
ZBE 08S-02 Right-angled connector, with 2 m cable, screened, 5 pole, M12x1	06019455
ZBE 08S-05 Right-angled connector with 5 m cable, screened, 5 pole, M12x1	06019456
ZBE 08S-10 Right-angled connector with 10 m cable, screened, 5 pole, M12x1	06023102

Dimensions are millimeters and for general information only, all critical dimensions should be verified by requesting a certified print.

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FCU 1000 Series
Fluid Control Units - Portable Models

Description

The FluidControl Unit FCU 1000 series combines the advantages of the portable contamination measurement units FCU 2000 series with the measurement technology of the ContaminationSensor CS 1000. The FCU 1000 is a portable service unit and is designed for temporary measurement of solid particle contamination in hydraulic systems. The integrated pump and the hoses which are contained in the scope of delivery of the FCU 1000 series.

- control circuits
- pressure circuits
- fluid sampling from pressureless reservoirs

Important Instructions / Restrictions

- Designed for hydraulic oils up to ISO VG 68 *(viscosity range 10 to 350 cSt)*
- Designed for temporary operation up to max. 30 minutes, followed by a rest period of 10 minutes *(no continuous operation)*
- Operating pressure: -0.5 to 45 bar, with pressure adaptor: 15 to 345 bar
- Not designed as a Bottle Sampler *(minimal volume of 300 ml is required for a bottle sample analysis)*
- Measurement recording with HMG 3000 is not possible *(the HMG 3000 cannot process the data from both FCU 1000 sensors simultaneously)*

Applications

- Hydraulic systems
- Service for mobile hydraulics
- Maintenance

Features

- Two contamination calibrations in one instrument (reversible)
  - ISO 4406:1987; NAS 1638
  - ISO 4406:1999; SAE AS 4059 (D)
- Saturation and temperature measurement through the built-in AquaSensor 1000
- Integrated pump for measurement in pressureless reservoirs
- Operation with 24 VDC network adaptor included in scope of delivery
- Interfaces: 5-pole plug, Bluetooth, USB data port

Technical Details

General Data	
Self-diagnosis	continuously with error indication via status LED and display
Display	LED, 6 / 4 / 4 digits, in 17 segment format
Measured Value	ISO code/ SAE Class / NAS Class / Saturation level / Temperature
Measuring Range	Display from ISO code 9/8/7 (MIN) to ISO code 25/24/23 (MAX) Calibrated within the range ISO 13/11/10 to 23/21/18 Saturation level 0 to 100% / Temperature -13° to 212°F (-25 to 100°C)
Accuracy	+/-1/2 ISO class in the calibrated range / ≤ ± 2 % Full scale max.
Seal Material	FPM
Ambient Temperature Range	32 to 113°F (0 to 45°C)
Storage Temperature Range	-40 to 176°F (-40 to 80°C)
IP class	IP 50 in operation IP67 closed
Weight	approx. 29 lbs (13 kg)
Hydraulic Data	
Operating Pressure with Adaptor for Pressure Lines	**in:** -0.5 to 45 bar / -7.25 to 650 psi **out:** 0 to 0.5 bar / 0 to 7.5 psi **in:** 15 to 345 bar / 217 to 5000 psi **out:** 0 to 0.5 bar / 0 to 7.5 psi
Pressure max.	345 bar / 5000 psi
Measurement Flow Rate	30 to 300 ml/min *(viscosity dependant)*
Maximal Suction Height	1 m
Permissible Viscosity Range with Adaptor for pressure lines	10 to 350 cSt 46 to 1622 / SUS 2 to 350 cSt 10 to 1622 / SUS
Fluid Temperature Range	32 to 158°F (0 to 70°C)
Electrical Data	
Power Supply Voltage	24 V DC ±20%, residual ripple < 10%
Max. Power / Current Consumption	100 Watt / 4 A
Interface	Plug connection, 5-pole, male, M12x1 *(only for HYDAC Sensor Interface -HSI)*

We do not guarantee the accuracy or completeness of this information. The information is based on average working conditions. For exceptional operating conditions please contact our technical department. All details are subject to technical changes.

www.comoso.com

Model Code

FCU 1 3 1 0 - 4 - U - AS - 1

Series
FCU = Fluid Control Unit

Model
1 = 1000 Series, 4 particle size channels

Contamination Code
3 = ISO 4406:1987; NAS 1638 / 2-5 µm, 5-15 µm, 15-25 µm, > 25 µm
ISO 4406:1999; SAE AS 4059 (D) / > 4 µm(c)> 6 µm(c)> 14 µm(c)> 21 µm(c) — reversible between

Housing
1 = for portable use *(plastic case with appending bag for hoses and cables)*

Fluids
0 = Mineral Oil, Synthetic Esters/PAO, Quintolubric, Cosmolubric *(Consult factory for other fluid types.)*

Options
4 = with Integrated Pump

Supply Voltage
U = 24 V DC

Integrated Sensor
AS = AquaSensor *(AS 1000 series)*

Power Supply Adapter
1 = 100 to 240 V AC / 50/60 Hz / 1 Phase, *(Europe, USA/Canada, UK, Australia, Japan)*

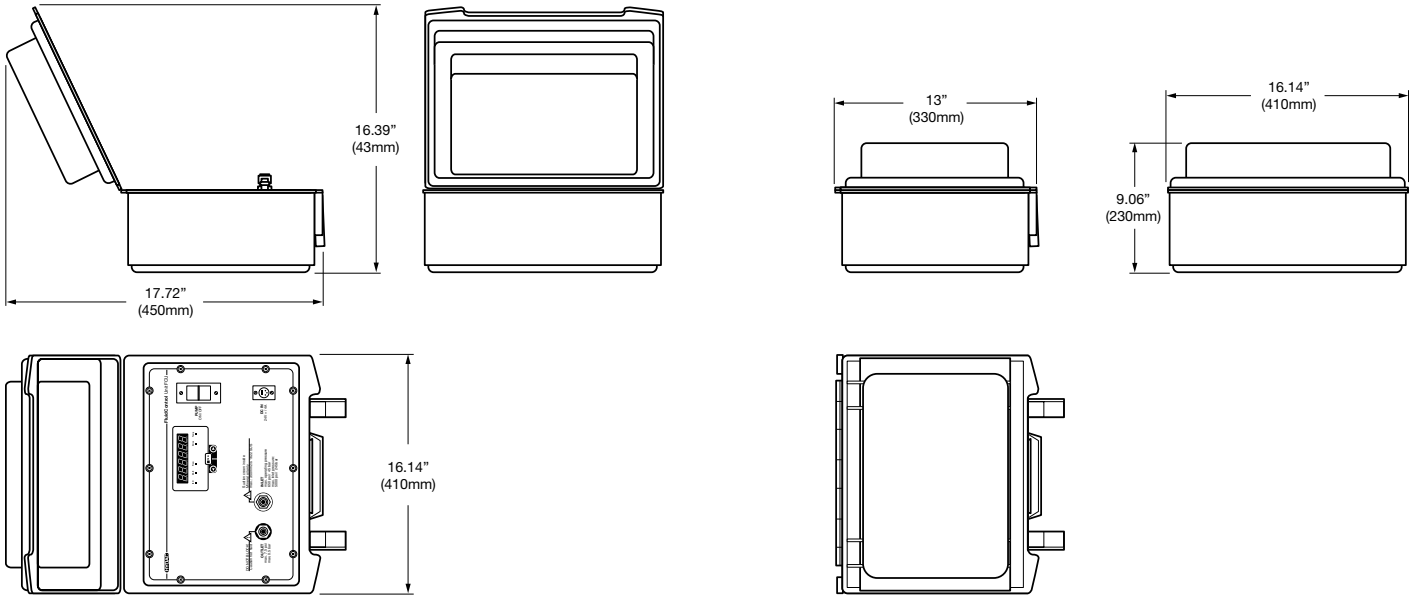
Scope of Delivery

- FluidControl Unit FCU 1000
- Power supply AC adaptor with connecting cables to supply voltage for Europe, USA/Canada, UK, Australia, Japan
- Adaptor for pressure lines
- INLET pressure hose with screw connection for Test Point 1620, black, length = 2 m
- INLET suction hose, open end, clear, length = 0.3 m
- OUTLET return hose, open end, clear, length = 1 m
- Operating and Maintenance Instructions / Calibration certificate
- USB Memory Stick

Accessories

- Battery pack - P/N 03504605
- Cable with universal plug (for cigarette lighter or socket from supply system on board), L = 10 m - P/N 03306236

Dimensions



Dimensions are for general information only, all critical dimensions should be verified by requesting a certified print.

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FCU 2000 Series
Fluid Control Units

FCU 2000-1

FCU 2000-4

Description
The FCU 2000 Series Fluid Control Unit is the second generation of diagnostic equipment for measuring and controlling contamination in hydraulic and lubrication systems. These Units are portable, which makes them ideal for use on multiple machines in a plant, or in-the-field use. The rugged construction incorporates a folding handle which also serves as a prop stand for optimal viewing.

Online Measurement
A key advantage of the FCU is that it allows the user to measure changes in contamination instantaneously as they occur. The unit continuously detects solid particles and displays the results in cleanliness classes according to ISO 4406 (1992 or 1999), SAE AS 4059 or NAS 1638 standards.

Tank Extraction
The FCU 2000-4 model is equipped with a specific suction inlet and an integrated pump for reservoir, in addition to the standard online measurement capability.

Comprehensive Reporting
Measurements are automatically stored in memory and can be used to print tabular and graphic reports in a wide variety of formats. Although extensive functions for data recording and documentation are available, clear built-in menus make it easy for a user to develop highly informative reports with minimal training.

PC Capability
For many applications, the built-in printer will produce the necessary reports. In addition, data can be transmitted to a PC via an RS232C interface, providing the user with flexibility in analysis with the supplied CoCos light software package, or with standard packages like MS-EXCEL.

Contamination Control
By means of control software, the user can program the FCU to activate an auxiliary filtration unit through built-in relays when contamination reaches a specified maximum level. This makes it possible to control system cleanliness reliably and automatically.

The FCU also can be programmed to de-activate an off-line unit when contamination reaches a preset target level, an especially useful feature in flushing operations.

Applications
The versatility and simplicity of the FCU 2000 Series is advantageous in various applications:

- Preventive Maintenance
- Field Service
- System Production and Testing
- Fluid Cleanliness Documentation
- Flushing Process Control

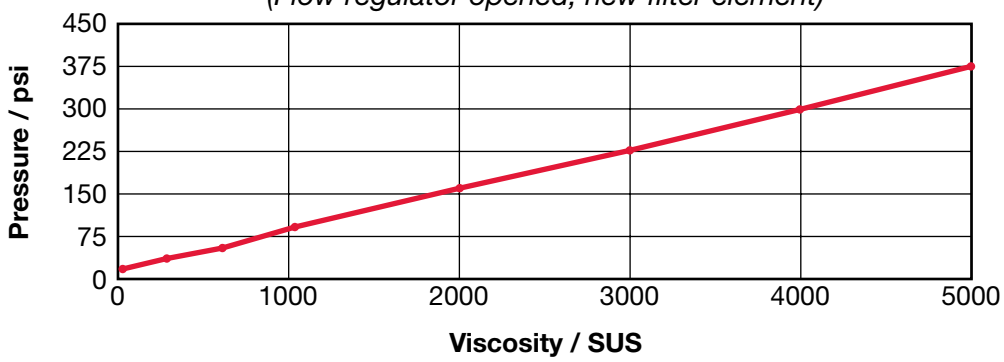
www.comoso.com
PN#02075860 / 12.11 / FSP1110-1386

Technical Details

	FCU 2100	FCU 2200
Particle size channels	2µm / 5µm / 15µm / 25µm	$4\mu m_{(c)}$ / $6\mu m_{(c)}$ / $14\mu m_{(c)}$ / $21\mu m_{(c)}$
Measurement Range	NAS 2 to 12	SAE 2 to 12
	ISO 13/11/10 to 23/21/18	ISO 13/11/10 to 23/21/18
Indication Range	NAS 2 to 15	SAE 2 to 15
	ISO 12/10/9 to 25/23/21	ISO 12/10/9 to 25/23/21
Accuracy	± 1/2 class (ISO, NAS, SAE)	
Calibration	ISO 4402	ISO 11943
Recalibration	Recommended every 2 years	
Log Memory	Can accommodate up to 3000 measured values / 100 Test Headers	
Inlet Operating Pressure	45 to 5000 psi	
Outlet Flow Rate	800 ml/min max	
Outlet Operating Pressure	max 45 psi back pressure	
Measurement Flow Rate	50 - 150 ml/min	
Permissible Viscosity Range	1 to 1000 cSt *(inlet port, see graph below)* / 1 to 150 cSt *(suction port, continuous operation)* / 150 to 350 cSt *(suction port, brief operation, 10 min.)*	
Fluid Temperature Range	32° to 160°F	
Supply Voltage	24 V DC, ± 25% or 110 V AC with supplied adapter	
Wattage	25 W max	100 W max
Battery Powered Operating Duration	Measurement without pump or pump supplied externally: up to 6 hours	
Serial Port	RS 232 with 15-pin Sub D plug	
Ambient Temperature Range	0° to 130° F	
Storage Temperature Range	-4° to 185° F	
Relative Humidity	max 90%, non-condensing	
Protection Type	IP40	
Weight	approx. 30 lbs (13.6 kg)	

The minimum inlet pressure required to achieve a flow rate of 100 ml/min for a given viscosity can be found by referring to the graphic below.
The required inlet pressure increases with increasing clogging of the filter element.

Pressure Required at the FCU High-Pressured Port
***(inlet)* for a Flow Rate of 100 ml/min**
(Flow regulator opened, new filter element)



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Model Code

FCU 22 10 1 K KIT

Series
FCU = Fluid Control Unit

Model
21 = 3 digit ISO 4406 Code (>2/>5/>15µm) and NAS 1638
22 = 3 digit ISO 4406 Code (>4/>6/>14µm) and SAE AS 4059

Media
10 = Mineral Oil
11 = Phosphate Ester/Skydrol (not available with pump option -4)

Options
1 = without Integrated Pump
4 = Integrated Pump

Supply Voltage
K = 110V

Component Package
KIT = Includes Components
- Minimess Adapter to SAE-6
- One Inlet and One Outlet Hose
- CoCos Light Software Package *(CD supplied with Unit – Also available for download from www.hydac.com)*
- PC Cable
- Power Adapter
- Instruction Manuals
- Shipping Case

Additionally for FCU 2xxx-4:
- Second power adapter
- Suction hose 6mm bore *(1m length)*
- Suction hose 6mm bore *(0.2m length)*

Model Codes Containing RED are non-standard items – Minimum quantities and longer lead times may apply - Contact HYDAC for information and availablity

FCU Accessories

FCU Accessories	Part Number
Aluminum Transport Case for FCU-1 Series	00349153
Aluminum Transport Case for FCU-4 Series	03040814
Printer Paper (5 rolls)	00349155
Printer Ink Ribbon	00349156
Line Adapter 110V	03090803
High Pressure Hose (2 meters / 6.5 feet)	00349150
Return Hose (2 meters / 6.5 feet)	00349151

TestPoints available in HYDAC Hydraulic Accessories #02080105

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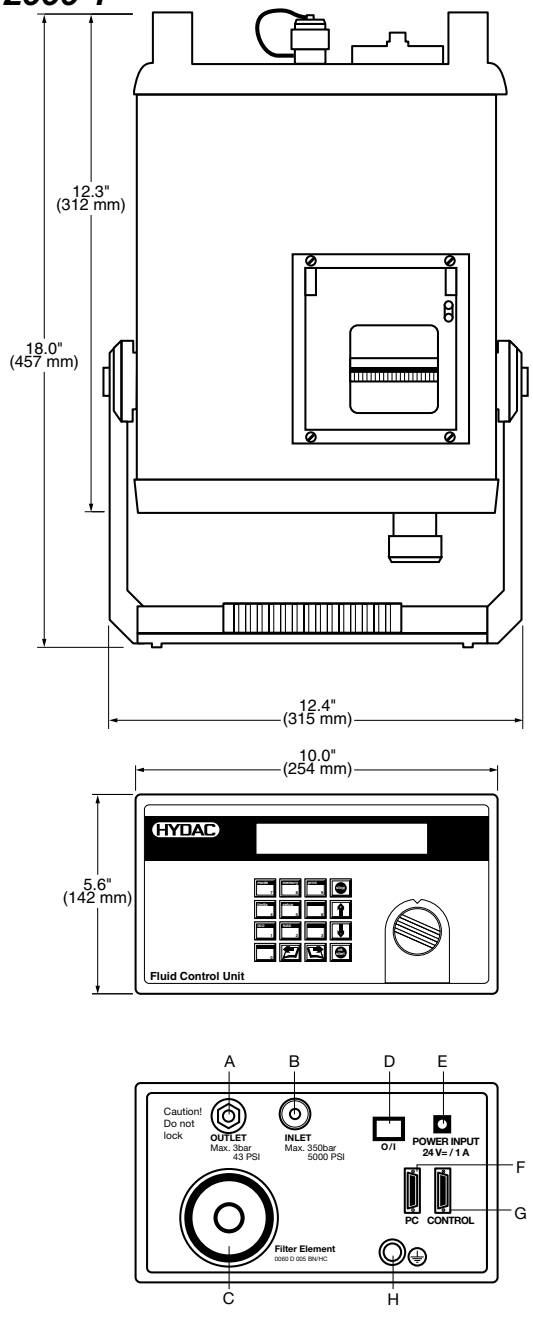
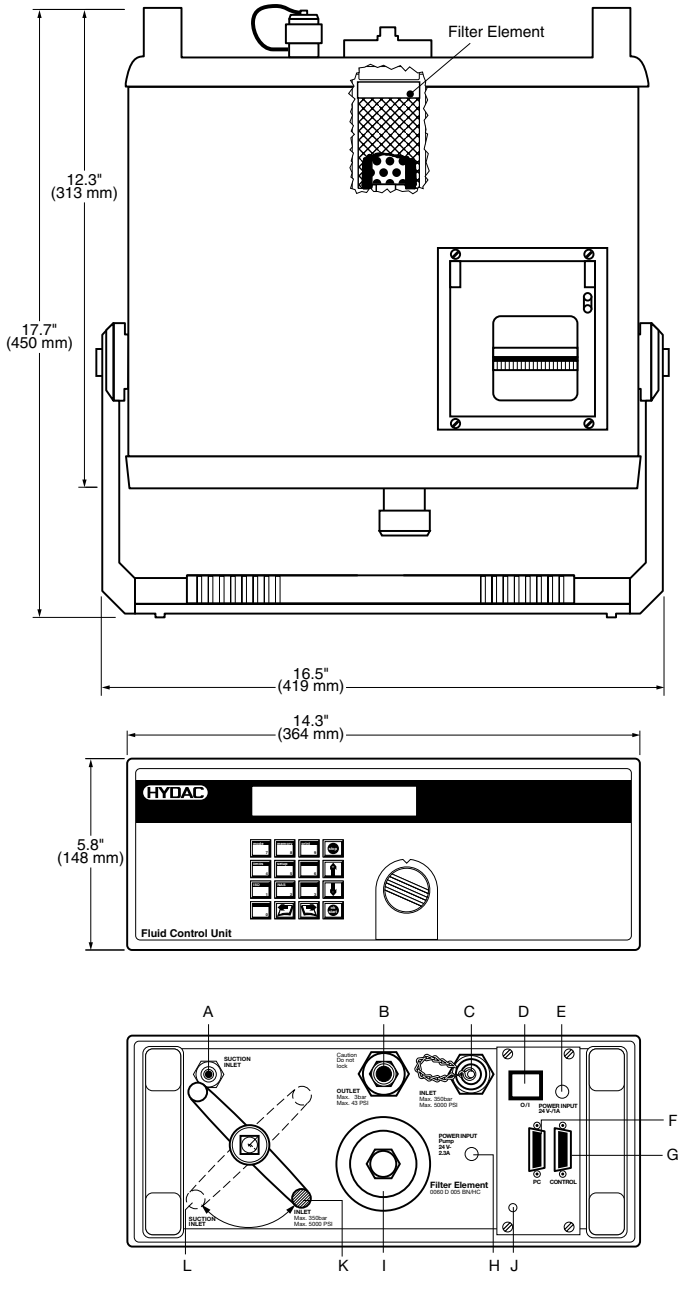
Dimensions

FCU 2000-1



FCU 2000-4



A = Outlet *(return flow to tank)*
B = Inlet *(high pressure port)*
C = Filter Cover
D = On/Off Switch
E = Power Supply Connection *(main)*
F = PC Connector *(serial port)*
G = Control Connector
H = Case Ground

A = Suction Inlet *(suction port)*
B = Outlet *(return flow to tank)*
C = Inlet *(high pressure port)*
D = On/Off Switch
E = Power Supply Connection *(main)*
F = PC Connector *(serial port)*
G = Control Connector
H = Power Supply Connection *(pump)*
I = Filter Cover
J = Case Ground
K = Ball Valve *(for INLET/high pressure port)*
L = Ball Valve *(for SUCTION INLET/suction port)*

Dimensions are for general information only, all critical dimensions should be verified by requesting a certified print.

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MCS Series
Metallic Contamination Sensor

Description

The Metallic Contamination Sensor MCS 1000 detects metallic solid particle contamination in lubrication fluid. The particles are determined according to the inductive measurement process, in which a coil system is the key element of the sensor. Metallic particles (ferromagnetic Fe and nonferromagnetic nFe) in the > 200 µm size range are detected.

The MCS 1000 continuously monitors the status of the system and gives information on imminent gear unit damage. This makes the sensor a reliable instrument for status-oriented maintenance.

Features

- Early detection of imminent gear unit damage
- Prevention of expensive plant downtime
- Optimal supplement to optical sensors
- Measurement of metallic particles (ferromagnetic and non-ferromagnetic) > 100 µm
- Measurement result is not affected by air bubbles or liquid contamination in the liquid

Applications

- Wind Turbines
- Marine Thrusters
- Industrial Gear Boxes
- Mobile Drive Systems
- Lubrication Systems
- Flushing Systems
- Test Stands

Technical Details

General Data	
Ambient temperature	-40 ... +70°C
Diameter sensor cross-section	MCS1410 = 1/2" (12.7mm) MCS1510 = 1" (25.4 mm)
Protection class to DIN 40050	IP 67
Weight	approx. 8 lbs (3.5 kg)
Dimensions (L x W x H)	83 x 162 x 140 mm
Vibration 10 - 58 Hz 58 - 500 Hz	 0.75 mm (amplitude) 10 g (acceleration)
Shock	40 g
Hydraulic Data	
Flow rate	10 ... 200 l/min
Operating pressure	20 bar max.
Fluid temperature range	-40 ... +85°C
Inlet / Outlet	Flange connection, SAE 4" according to ISO 6162-1
External Electrical Data	
Supply voltage	9 ... 36 V DC, residual ripple < 10%
Power consumption	5 W max.
Internal Electrical Data	
2 Configurable switching outputs *(n-switching Power MOSFET, normally-open)*	1 x Ferromagnetic particles (Fe) 1 x Non-ferromagnetic particles (nFe) or 1 x Ferromagnetic particles (Fe) + Non-ferromagnetic (nFe) 1 x Status signal
Alarm relays capacity	1.5 A max.
RS485 interface	2 wire, half duplex
HSI interface	1 wire, half duplex
Detection limits	
ferromagnetic (Fe) particles	200 µm *(particle, whose volume corresponds to a sphere with Ø 100 µm)*
non-ferromagnetic (Fe) particles	400 µm *(particle, whose volume corresponds to a sphere with Ø 200 µm)*
Max. particle count	100 / s at a pulse duration of 7 ms at the signal output

We do not guarantee the accuracy or completeness of this information. The information is based on average working conditions. For exceptional operating conditions please contact our technical department. All details are subject to technical changes.

www.comoso.com

Model Code

MCS 1 5 1 0 - 5 - 0 / 000

Series
MCS = Metallic Contamination Sensor

Model
1 = 1000 Series

Contamination Code
4 = particles > 100 um / 1/2”
5 = particles > 200 µm / 1”

Options
1 = Standard

Fluids
0 = Mineral and synthetic oils (particulary used in wind power industry)

Hydraulic connection
2 = Flange Connection, SAE 3/4” according to ISO 6162-1 *(only for MCS14xx)*
5 = Flange connection, SAE 4“ according to ISO 6162-1 *(only for MCS15xx)*

Electrical Installation
0 = Standard

Modification number
000 = Standard

Scope of Delivery

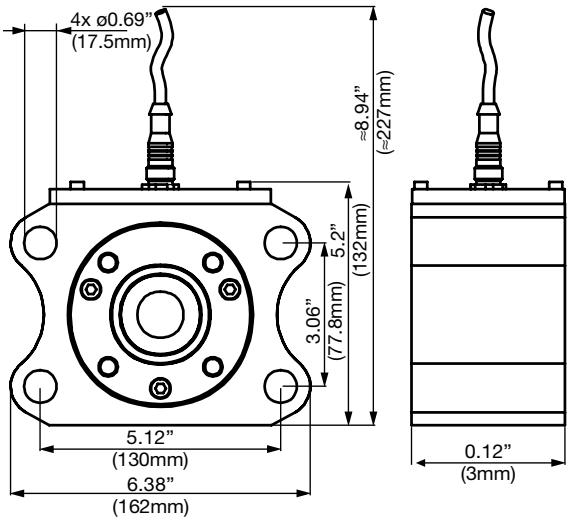
- MCS 1000
- O-ring (47.22x3.53 NBR 70 Shore)
- O-ring (110.72x3.53 NBR 70 Shore)
- Operating and maintenance instructions

Accessories

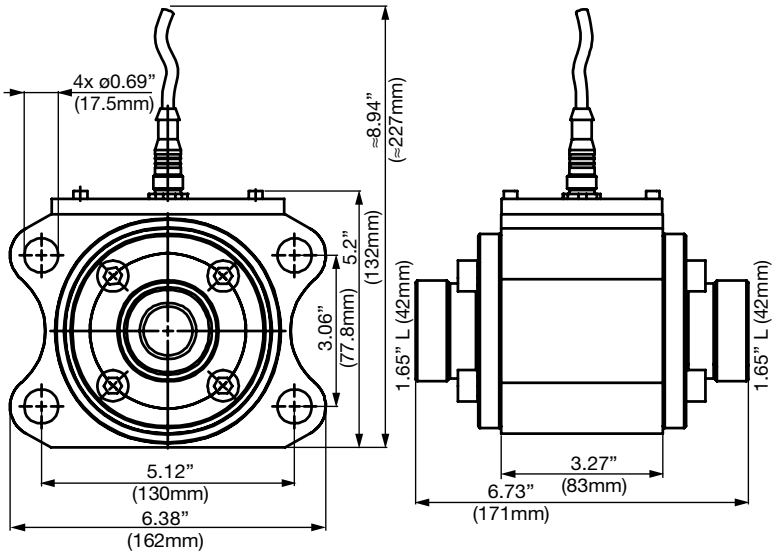
- SAE 4“ Flange adaptor set for pipe or hose connection, 42L according ISO 8431-1 Consisting of: 2x Flange adaptors, 2x O-rings, 8x Cylinder screws, 8x Washers, 8x Spring washers, P/N: 3435426
- Flange adaptor plate, SAE 4” – SAE 1½”, P/N: 3442518
- Socket plug (female) with 2 m line, shielded, 8-pole, M12x1, P/N: 3281220
- Socket plug (female) with 5 m line, shielded, 8-pole, M12x1, P/N: 02702459
- Extension cable 5 m, Socket plug (female) 8-pole, M12x1 / Socket plug (male) 8-pole M12x1, P/N: 3281240
- Socket plug with screw clamp, 8-pole, M12x1, P/N: 3281243

Dimensions

Flange connection, SAE 4“ according to ISO 6162-1



MCS with accessory flange adaptor set *(optional)*



Dimensions are for general information only, all critical dimensions should be verified by requesting a certified print.

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AS 1000 Series
AquaSensor

Description

The AS 1000 series AquaSensor is a stationary, microprocessor based measurement unit for the continuous monitoring of the water saturation level and temperature in hydraulic and lubrication systems. The sensor measures the water content relative to the saturation concentration *(saturation point)* and output the degree of saturation *(saturation level)* in the range of 0 to 100% as a 4 - 20 mA signal. A reading of 0% would indicate fluid that is free of water, while a reading of 100% would indicate a fluid that is saturated with water.

Water in Oil

It is almost certain that there is water present in hydraulic and lubrication systems. These systems should be operated without the presence of free or emulsified water. The most common sources of water entering a system are ambient humidity, “splash” from process water, and new oil. Water contamination will accelerate the aging process of the oil resulting in oil oxidization, additive depletion, reduced lubrication, corrosion and damaged components. Most of these costly problems can be avoided by monitoring the water content of the operating fluids.

Sometimes the water content is difficult to determine, but with the HYDAC AquaSensor, determining the amount of water is easy! The most practical method for monitoring water content in oil is as a percent of the saturation level. Different oils are capable of dissolving varying amounts of water, therefore they have varying water saturation curves. The curve *(below)* is an example of the typical relationship of water saturation level versus fluid temperature in hydraulic and lubrication oils. By looking at the example graph it can be seen that this fluid is capable of holding more water, or has a higher saturation level, as the temperature increases.

Applications

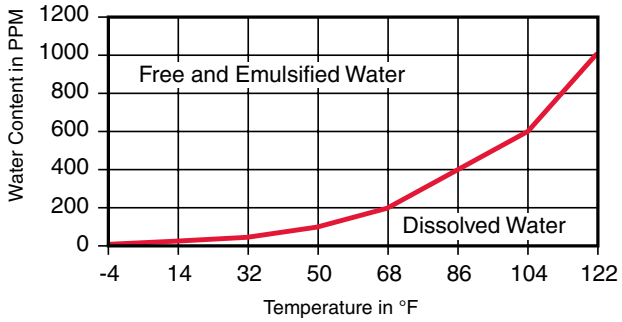
- Hydraulic systems that are sensitive to water
- Gear boxes
- Molding machines
- Turbines
- Transferrers

Technical Details

Input Data	
Measuring range *(temperature)*	-13° to 212°F (-25° to 100°C)
Measuring range *(saturation level)*	0 to 100%
Operating pressure	max. 725 psi (50 bar)
Burst pressure	> 9000 psi (630 bar)
Parts in contact with fluid	Stainless steel, FPM seal, ceramic with evaporated metal
Output Data - Humidity Measurement	
Output level *(saturation level)*	4 to 20 mA
Calibrated accuracy	≤ ± 2% FS max.
Accuracy in media measurements	≤ ± 3% FS typ.
Pressure dependent	+ 0.02% FS / bar
Output Data - Temperature Measurement	
Output signal *(temperature)*	4 to 20 mA
Accuracy	≤ ± 2% FS max.
Nominal temperature range *(measuring saturation level)*	32° to 194°F (0° to 90°C)
Ambient temperature range	-40° to 212°F (-40° to 100°C)
Viscosity range	32 to 23175 SUS (1 to 5000 cSt)
Flow velocity	< 16 ft/sec
Permissible fluids	Fluids based on mineral oil and synthetic and natural esters
CE mark	EN 50081-1, EN 50081-2, EN 50082-1, EN 61000-6-2
Type of Protection acc. DIN 40050	IP67
Other Data	
Supply voltage	12 to 32 V DC
Residual ripple	≤ 5%
Thread connection	G 3/8 BSPP male thread
Torque rating	approx. 18 ft/lbs
Electrical connection Pin 1: +Ub Pin 2: Signal saturation level Pin 3: 0V / GND Pin 4: Signal temperature Pin 5: not connected	M12x1.5 pole (DIN VDE 0627)
Reverse polarity protection of the supply voltage, excess voltage, override and short circuit protection	Standard
Weight	approx. 5 oz (145 g)

note: FS (Full Scale) = relative to the full measuring range

Example of a Hydraulic Oil Saturation Curve



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Model Code

AS 1 0 0 8 - C - 000

Series
AS = AquaSensor

Measuring Range
1 = Saturation level 0 to 100%; Temperature -13° to 212°F (-25° to 100°C)

Fluids
0 = Mineral oils
1 = Phosphate esters (HFD-R)

Mechanical Connection
0 = G 3/8A DIN 3852

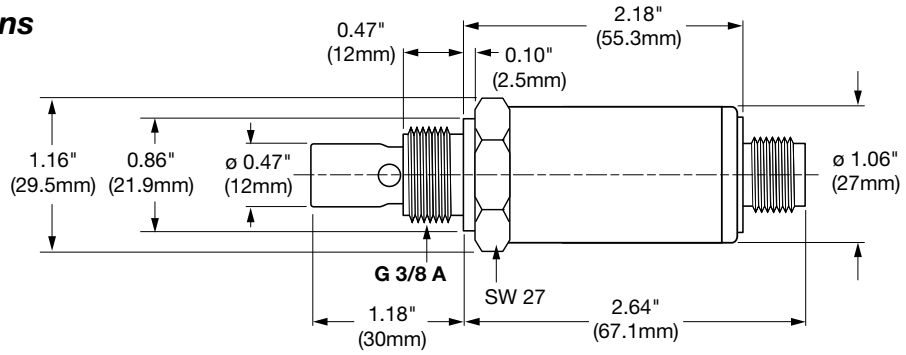
Electrical Connection
8 = Plug M12x1, 5-pole *(connector not included)*

Signal Technology
C = Saturation level 4 to 20 mA (0 to 100%), Temperature 4 to 20 mA (-25° to 100°C)

Modification Number
000 = Standard

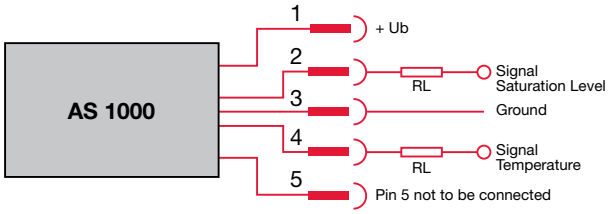
Items supplied
- AquaSensor
- Operation Manual

Dimensions



Dimensions are for general information only, all critical dimensions should be verified by requesting a certified print.

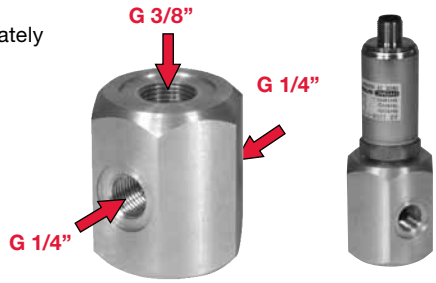
Circuit Connection



Color Codes for connectors with cables:
1 = brown
2 = white
3 = blue
4 = black
5 = gray

AS 1000 G1/4 Housing Block Adapter

Part #03182134
Purchase separately



Accessories

ZBE 08 Connector
5 Pole M12x1 90°

ZBE 08 connector only (IP65)
Part #06006786

ZBE 08-02-4 with 2 meter cable (IP67)
Part #06006792

ZBE 08-05-4 with 5 meter cable (IP67)
Part #06006791

HDA 5500-0-0-AC-000 Display
Part #00908861

HDA 5500-0-0-DC-000 Display
Part #00908862

HDA 5500-1-0-DC-000 Display
Part #00908868

HDA 5500-1-1-AC-000 Display
Part #00908869

HDA 5500-1-1-DC-000 Display
Part #00908870

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SMU 1200 Series
SensorMonitoring Unit

Description

The SensorMonitoring Unit SMU1200 is a display unit for HYDAC fluid sensors and is designed to display and store measured data. The following combinations of fluid sensors can be connected directly:

- ContaminationSensor CS1000 & AquaSensor AS1000
- MetallicContamination Sensor MCS1000 & AquaSensor AS1000

Advantages

- Simple installation parallel to the customer system *(HYDAC Sensor Interface HSI for SMU1200, transfer of the sensor's own analogue and switching outputs)*.
- Simple installation using the magnetic holder or DIN rails.
- High protection rating IP67. Installation in a switch cabinet is not necessary.
- Plug & Work unit including the 5m connection cable required for direct connection of the sensors *(sensor connections via M12x1 male connectors, no programming necessary)*.
- The measured data is displayed on the large display.
- Simple keypad operation.
- Data is stored in the SMU with a date and time stamp.
- Measured values can be read from the standard USB memory stick supplied via the USB master port.
- Simple data processing and data evaluation using MS-Excel or HYDAC FluidMonitoring Software FluMoS *('light version' available as freeware at www.hydac.com)*.
- Program restarts independently once voltage is restored; no loss of measured data.

Technical Details

Mounting position	Optional
Self-diagnostics	Continuously with error indication on display
Display	LED, 6/4/4-digit, each with 17 segments
Rough handling *(to IEC/EN 60068-2-31)*	Drop height 50 mm
Ambient temperature	0 °C to +55 °C
Storage temperature range	-40 °C to 80 °C
Relative humidity	Maximum 95%, non-condensing
Weight	≈ 1 kg
Electrical Data	
Supply voltage	12 to 24 V DC (±10%) The SMU must not be used with vehicle supply systems without load dump protection of maximum 30 V DC.
Residual ripple	≤ 5%
Power consumption	15 Watt, 1.25 A max.
Accuracy of the real-time clock	± 5 s/day / ± 0.5 h/year
Clock buffer	≈ 20 years)
Protection rating	III (safety extra-low voltage)
Protection class	IP 67

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Model Code

SMU 1 2 6 0 - TU - 00 / 000

Type
SMU = SensorMonitoring Unit

Series
1 = 1000 Series

Data input
2 = Digital

Interface
6 = HSI + USB Master

Application
0 = Standard

Supply voltage
TU = 12 to 24 V DC

Sensor combination

	A	B
00 =	CS1000	AS1000
10 =	MCS1000	AS1000

Customer modification number
000 = Customer modification number

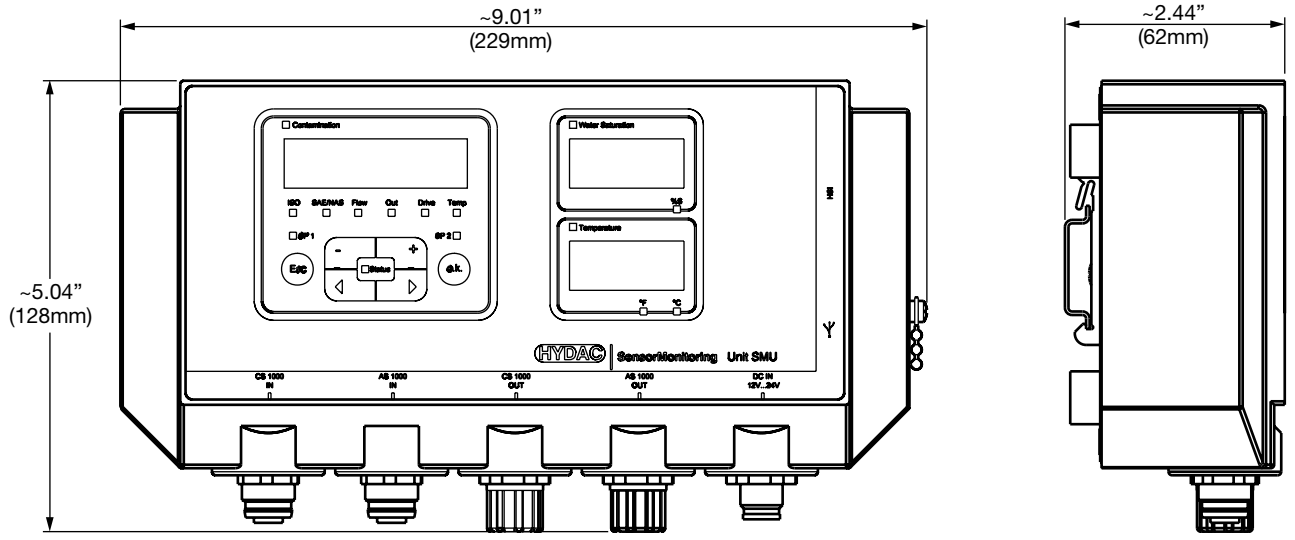
Items supplied

- 1 SMU 1200 series
- 1 USB memory stick
- 1 connection cable 5 pole with flying leads for power supply, L = 5m
- 2 connection cables appropriate to the sensor combination, L = 5m
- 1 FluMoS light CD
- 1 User manual
- 1 DIN rail, L = 20 cm

Accessories

Power supply PS5,
100-240 V AC / 50-60 Hz / 1.1 A -> 24 V DC / 1000 mA,
Cable length = 1.8 m, PN: 3399939

Dimensions



Dimensions are for general information only, all critical dimensions should be verified by requesting a certified print.

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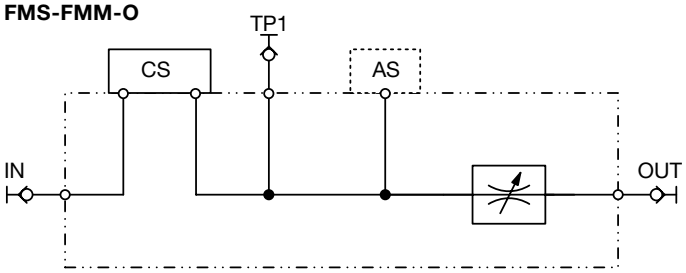
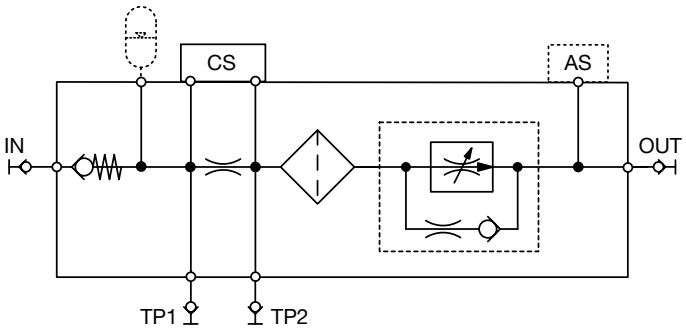
FMS Series
FluidMonitoring System

Hydraulic Circuits

FMS-FMM-O



FMS-FMM-P



Description

The FluidMonitoring System FMS combines HYDAC's Condition Monitoring Products ContaminationSensor CS1000 and AquaSensor AS1000 and the SensorMonitoring Unit in one system.

The FMS is used as a robust and stationary system for online measurement of solid particle contamination and water content in hydraulic and lubricant fluids (e.g. for the detection of leakages).

The SMU shows the cleanliness class and the fluid temperature as well as the relative humidity. These values are passed on via the signal output for further processing.

The FMS features all of the requisite connectors / adapters, enabling it to be easily connected to existing hydraulic circuits.

Depending on the version, the FMS is suitable for bypass flow and pressure circuits:

FMS-FMM-O… = 6 – 15 bar

FMS-FMM-P… = 15 – 300 bar

Advantages

- Cost-effective solution
- Early warning of critical machine states
- Continuous fluid monitoring
- Condition-based maintenance planning

Caution!
The FMS is only to be used with mineral oils or mineral oil-based raffinates.

Technical Details

FMS-FMM-O…	
Operating pressure	6 to 15 bar / 87 to 217 psi
Minimal differential pressure	1 bar, recommended ≥ 3 bar
Connectors (IN / OUT)	Test point type 1604 or thread G 1/4 according ISO 228
Sealing material	FPM
Permissible viscosity range	1 to 350 mm²/s
Fluid temperature range	0° to 85° C / 32° to 185° F
Ambient temperature range	-30° to 80° C / -22° to 176° F
Storage temperature range	-40° to 80° C / -40° to 176° F
Weight	~13 kg
FMS-FMM-P…	
Operating pressure without accumulator with accumulator	 15 to 300 bar / 217 to 4350 psi 15 to 250 bar / 217 to 3625 psi
Differential pressure	> 15 bar
Connectors (IN / OUT)	Test point type 1604 / thread G¼ according ISO 228
Sealing material	FPM
Permissible viscosity range	1 to 1000 mm²/s
Fluid temperature range	0° to 85° C / 32° to 185° F
Ambient temperature range	-30° to 80° C / -22° to 176° F
Storage temperature range	-40° to 80° C / -40° to 176° F
Weight	~20 kg

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Model Code

FMS - FMM-P - CS - AS - SMU12 - 01 / - 000

Type
FMS = FluidMonitoring System

Hydraulic application
FMM-O = Offline, bypass flow circulation < 15 bar)
FMM-P = Pressure Line, (pressure circuit > 15 bar)

ContaminationSensor
CS = CS 1000 *
Z(CS) = Prepared for CS 1000

AquaSensor
AS = AS 1000
Z(AS) = Prepared for AS 1000

SensorMonitoring Unit
SMU12 = SMU 1200

Sensor combination
01 = FMM-O-M-0-CS1310-A-AS-0-0-0/-000 SMU1260-TU-00/-000
02 = FMM-P-L-0-CS1310-A-AS-0-1-0/-000 SMU1260-TU-00/-000

Customer modification number
000 = Customer modification number

*Type defined in sensor combination number

Items supplied

- 1 FluidMonitoring System FMS
- 1 Power supply connection cable, L = 5m

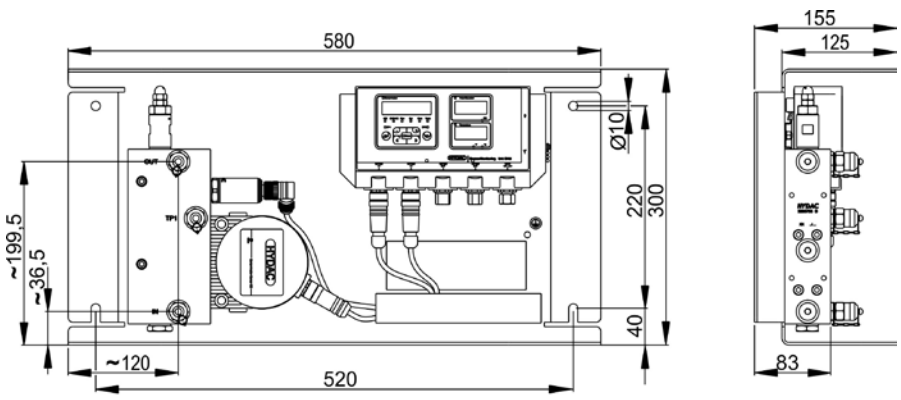
Technical Documentation, consists of:

- 1 Installation and Maintenance Instructions FMS
- 1 Operating and Maintenance Instructions SMU 1200
- 1 Operating and Maintenance Instructions AS 1000
- 1 Calibration certificate of the CS1000

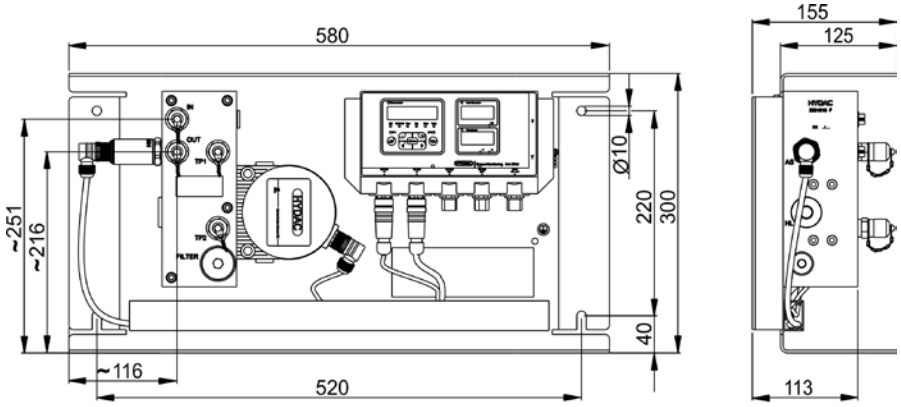
Upon receiving the FMS check it for any damage in transit. Do not put the FMS into operation unless it is in perfect condition. Report any damages in transit to the transport company or the responsible agent immediately. Do not put the unit into operation.

Dimensions

FMS-FMM-O



FMS-FMM-P



Dimensions are for general information only, all critical dimensions should be verified by requesting a certified print.

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CTU 1000 Series
Contamination Test Unit

Description

The HYDAC Cleanliness Test Unit CTU 1000 is the latest addition to the existing CTU 2000 series. Designed to determine the technical cleanliness especially present on minor contaminated components.

The cause for the development are the increased demand for system cleanliness and for monitoring and optimizing the cleanliness, especially of smaller components during production, storage and system assembly.

By determining the type, size and quantity of the contamination, quality standards can be checked and documented and the necessary steps towards optimization can be taken.

Applications

- Automotive suppliers
- Gear box builders
- Engine builders
- Suppliers of hydraulic and lubrication component

Benefits to You

- Cost reduction through lower production failure rates
- Identification and elimination of weak process steps
- Optimization of both internal and external handling processes
- Establishing of cleanliness standards both internal and external
- Documentation of component cleanliness
- Survey of fluid cleanliness and filtration concepts

Technical Details

Overall dimensions *(height x width x length)*	CTU10xx - 1800 mm x 1000 mm x 900 mm CTU12xx - 1800 mm x 1000 mm x 1100 mm
Weight	CTU10xx approx. 595 lbs (270 kg) approx. 640 lbs (290 kg) (*with ultrasonic)* CTU12xx approx. 685 lbs (310 kg)
Type	Mobile *(mounted on castors)*
Power Consumption	600 W *(800 W with ultrasonic)*
Ambient Temperature	59° to 82°F (15° to 28°C)
Cleanroom Module	
Material of cleanroom	polished stainless steel
Filling with analysis fluid	via analysis cabinet
Control	PC controlled with user-friendly software, rinse options and rinsing volume programmable
Reservoir and Filtration Module	
Membrane holder	for Ø 47 to 50 mm filter membranes
Vacuum strainer	for quicker filtration of the analysis fluid
Diffuser	Distribution of analysis fluid on the membrane
Operating pressure	-12 to 87 psi (-0.8 to 6 bar)
Analysis fluid reservoir	2x 20 l *(1x reservoir, 1x suction reservoir)*
Reservoir change-over	automatic
Filtration of analysis fluid	Fine filtration according ISO 4406 min. ISO 12/9
Filter clogging indicator	1 bar pressure setting
Filter size, filtration rating	2x LF BN/HC 60, 3 µm (1xx0 series) 2x MRF-1-E/1, 1µm (1xx1 series)
Integrated drip tray	25 liter with drainage
Services to be provided by operator*	
Compressed air	Air Filtered (min. 5µm) and dry compressed air, max. 6 bar Air flow rate: 60 l/min, Supply connection: DN 7.2
Power Supply	according to order

*not supplied

The information in this brochure relates to the operating conditions and applications described. For applications or operating conditions not described, please contact the relevant technical department. Subject to technical modifications.

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Model Code

CTU 1 0 0 0 - M - Z - Z

Series
CTU = Contamination Test Unit

Model
1 = Analysis cabinet *(clean room)*

Installation Size
0 = Dimensions analysis cabinet: 300 mm x 800 mm x 400 mm *(effective height x width x length)*
2 = Dimensions analysis cabinet: 550 mm x 800 mm x 650 mm *(effective height x width x length)*

Analysis
0 = with Analysis Membrane

Analysis Fluid
0 = Solvent A III Class *(Flashpoint > 60°C, lower explosion limit > 0.6 Vol.%)*
1 = Water with surfactants, admissible pH-range 6 to 10, no deionized / demineralized water

Supply Voltage
K = 120 V AC / 60Hz / 1 Phase USA / CDN
M = 230 V AC / 50Hz / 1 Phase Europe
N = 240 V AC / 50Hz / 1 Phase UK

Extraction Process
Z = Rinsing *(medium pressure)*
U = Rinsing *(medium pressure)* plus ultrasonic

Supplementary Details
Z = series
R = external rinsing connections Ø 6mm, between the hand holes

Blank Control Values

All data depends on ambient conditions

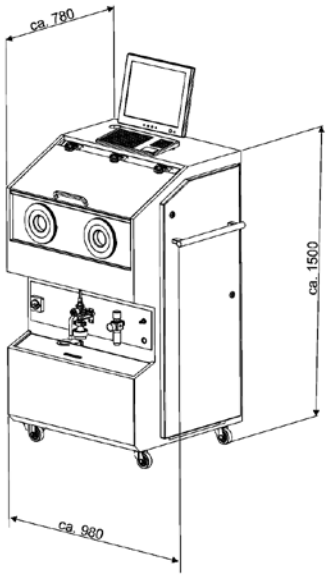
Ambient	CTU 1xxx
Cleanroom	0.4 to 0.6 mg
Laboratory	0.6 to 1.0 mg
Separate sampling room	0.6 to 1.2 mg
Workshop	1.0 to 1.4 mg

Max. particle size (µm)	Time and effort	Cleaning time [h] after a short standstill period (≤ 24 h)	Cleaning time [h] after a long standstill period (> 24 h)
100*	high	1.5 to 4	3 to 5
150*	medium	1 to 2	2 to 4
250*	low	0.5 to 1.5	1 to 3

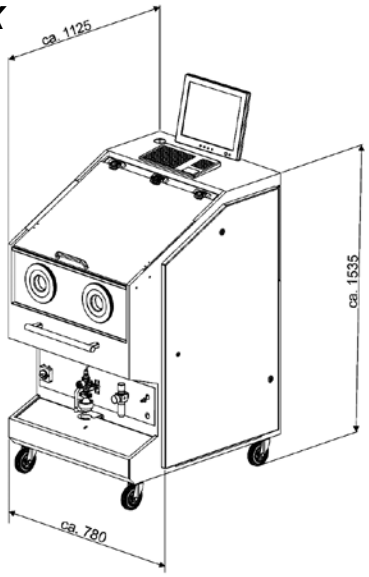
*with maximum membrane load of 0.8 mg

Dimensions

CTU10XX



CTU12XX



Dimensions are millimeters and for general information only, all critical dimensions should be verified by requesting a certified print.

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MM Series
Measuring Microscopes

Description

This measuring microscope is designed specifically to be used for measuring contamination particles in oil samples on filter membranes. All models include coarse and fine focusing adjustments, as well as both X and Y directional slide table adjustments to make focusing and positioning the subject simple, even at maximum magnification.

There is a rotating lens holder with 3 achromatic objective lenses with magnifications of 4x, 10x, and 20x. The micrometer eyepiece provides an additional 10x magnification resulting in 40x, 100x, and 200x magnifications. The measuring scale on the eyepiece has a scale division of 1 mm in 100 parts, allowing measurement of particles at all three magnifications.

These units come with an integrated plug-in light source that provides sufficient illumination, even at maximum magnification.

The optional CCD digital camera attaches to the eyepiece and transfers images to a PC via a USB connection, making it easy to capture and transmit images from the microscope.

Ordering Information

MM-S5-P	Standard eyepiece 110 V 60 Hz powered light source
MM-S5-P-U	Standard eyepiece 110 V 60 Hz powered light source CCD camera with LPT-1 port for connection to laptop or PC
MM-KKE-P-C-U	Triocular eyepiece 110 V 60 Hz external cold light illumination CCD camera with LPT-1 port for connection to laptop or PC

Technical Details

MM-S5-P, MM-S5-P-U, & MM-KKE-P-C-U	
Huygens Eyepiece	10 x M
Achromatic Lens	4x, 10x, 20x
Magnification	40x, 100x, 200x
Supply Voltage	110 V 60 Hz
MM-S5-P-U & MM-KKE-P-C-U *(only)*	
Image Digitization	CCD-Camera
Video System	PAL color system
Resolution	horiz. 460 lines vert. 400 lines
Image Processing	Video capture unit
PC interface	LPT 1 port
System Requirements	min. Pentium 100 Mhz., Windows 95

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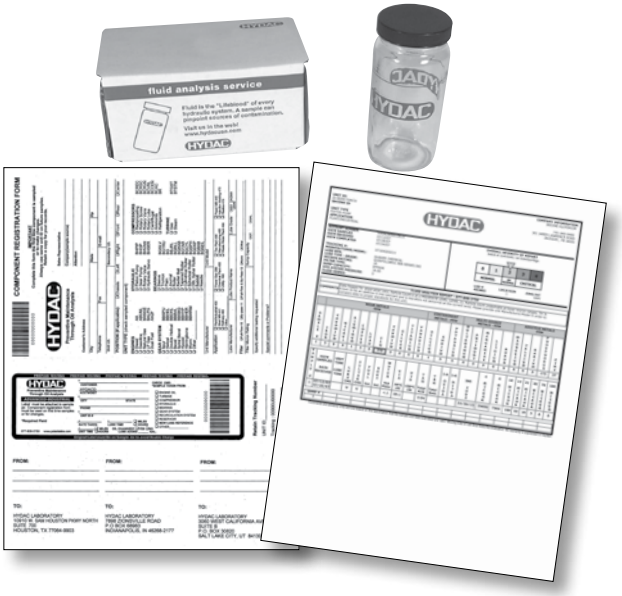
FAS Series
Fluid Analysis Service



Additional Oil Analysis Tests are available; contact factory for information

Premium Oil Sample Testing

Test Kit part number: 02702060 *(includes a box of 10 sample bottle kits)*

Oil sample analysis for standard mineral hydraulic and lube oil includes the following tests:

- Spectrometals by ICP (24 Metals including Wear, Contaminant, Additive & Multi-Source) – D5185
- Viscosity @ 40C (ASTM D445)
- Water % by Crackle (Karl Fischer if Crackle is Positive)
- Total Acid Number – TAN (ASTM D664)
- Particle Count (as per ISO4406:1999 - 3 digit ISO code 4, 6, 14)

Test Kit part number: 02095151 *(includes a box of 10 sample bottle kits),* the same as the above analysis as well as a photomicrograph

Water Glycol Sample Testing:

Test Kit part number: 02702057 *(includes a box of 10 sample bottle kits)*

This kit includes specific analysis parameters for the water to oil ratio of the Glycol. Karl Fischer Water is done and pH is tested instead of TAN. If the water concentration is tested out of specification to the identified lubricant, the lab will give the current concentration level and then make a recommendation for the acceptable water concentration percentage range for the stated lubricant. The tests included are as follows:

- Spectrometals (24 Metals by ICP including Wear, Contaminant, Additive & Multi-Source) – D5185
- Viscosity @ 40C – ASTM D445
- Water by Karl Fischer in PPM – ASTM D1744
- pH (If a Standard Mineral Oil is Identified, then TAN is done)
- ISO Particle Count (as per ISO4406:1999 - 3 digit ISO code 4, 6, 14)

Oil Analysis Reports:

Each Fluid Analysis Kit contains:

- Clean Sample Bottle
- Component Registration Form (CRF)
- Packaging for mailing sample
- Prepaid Fluid Analysis Service

Choice of three ISO 17025 A2LA accredited laboratories to send the samples. Addresses are included on the Component Registration Form

- All locations are within 48 hours ground transit from nearly anywhere in the continental United States
- Results returned within 24-48 hours after lab receipt of the test samples
- Fast email or fax notification of high severity results

A Component Registration Form (CRF) is included with each sample bottle kit, but it only needs to be filled-out the first time each piece of equipment is sampled or to make changes. After the initial sample, the CRF information is stored under the Unit ID #.

Sample results will be e-mailed to the e-mail address supplied on the CRF. Additionally, a Username and Password will be emailed to each report recipient who provides an e-mail address on the Component Registration Form (CRF). This feature allows multiple users to view the reports simultaneously. The Username and Password provides the recipient with access to www.eoilreports.com where a personal internet account has been set-up. From this site, the full sample report with the capability of graphing and trending analysis is available online as well as the complete testing history is securely stored.

HYDAC Canada
Fluid Analysis Services *(Canada Customers Only)*

Contamination Analysis

Test Kit Part Number: 02552392 (single); 02552390 (pack of 10)

This kit identifies contamination before it hampers production and shortens component life and includes:

- Particle Count
- Water Content
- Viscosity
- Patch Test/Photo

Total Conditioning Analysis Kit

Test Kit Part Number: 02552393 (single); 02552391 (pack of 10)

Includes all the above tests PLUS it determines: additive; wear metal; contaminant and oxidation levels. Tests included in this kit are:

- Particle Count
- Water Content
- Total Acid Number
- Viscosity
- Patch Test/Photo
- Spectrographic Analysis

Water Glycol Analysis Kit

Test Kit Part Number: 02550327

This kit is designed exclusively for water glycol systems. Contamination, water content and viscosity are monitored. Tests included:

- Water Content
- Viscosity
- Patch Test/Photo
- Estimated ISO 4406 cleanliness code

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HMG 500 Series

General

The HMG 500 Portable Data Recorder is a hand-held measuring unit for simple measuring tasks on hydraulic and pneumatic systems. Typical applications are in analysis, maintenance and service.

The HMG 500 has two analog input channels and can record the signals from HYDAC HSI sensors which are connected to it. HSI sensors *(HYDAC Sensor Interface)* are HYDAC sensors for pressure, temperature, and flow rate with automatic sensor recognition.

The HMG 500 automatically reads the measuring range and unit from each sensor that is connected. Manual adjustments of the measuring range settings are no longer required.

The measured values, actual, minimum and maximum, are recorded from the sensors. Depending on the requirement and setting, the following are displayed: the actual measured values *(channel A, B)*, the minimum or the maximum values *(channel A, B)*. The min/max values can be reset at any time at the touch of a button.

Furthermore the HMG 500 is capable of measuring and displaying the differential between the values on channel A and B (channel A - B).

General Specifications

Items supplied:

- HMG 500
- Manual D/E/F
- 9 V battery

Dimensions: 3.94 x 6.69 x 1.57 in. (100 x 170 x 40 mm)

Weight: 0.90 lbs. (0.41 kg)

Operating/Ambient Conditions
Operating temperature: 41° - 122°F (5° to 60°C)
Storage temperature: -4° - 158°F (-20° to 70°C)
Relative humidity: 0 to 70 %

Power Supply
A standard 9 V battery is required for operation. It is also possible to operate the unit using the AC mains adaptor plug listed under Accessories.

Special Features

Adjustment function for mechanical pressure switches

Technical Details

Sensor inputs:
The HMG 500 has two analog inputs on 2 input connections (channel A and B) for connecting HSI sensors with automatic sensor recognition *(pressure, temperature and flow rate transmitters)*.

Channel A and B:

- Automatic sensor recognition for HSI sensors (pressure, temperature or flow rate transmitters) and setting of measuring range and unit of measurement
- Measured value differential for channel A - B

Measurement accuracy of the input channels:

- ≤±0.1% of the measuring range

Measurement rate:

- 0.1 ms

Measurement & Display:

- Actual measured value
- Min/max values
- Measured value differential
- Change of the unit of measurement

Operating time using 9V battery (2 sensors):

- approx. 10 hours.

HMG 500 Kit #1: Part #00909470

Includes:

- HMG 500-000
- HDA 4748-H-0600-000
- ZBE 30-02 (cable M12x1 for HMG) 2m
- Gauge Adapter G1/4 female to Testpoint 16x2
- Case for HMG 500

HMG 500 Kit #2: Part #00909471

Includes:

- HMG 500-000
- 2 pcs. HDA 4748-H-0600-000
- 2 pcs.ZBE 30-02 (cable M12x1 for HMG) 2m
- 2 pcs. Gauge Adapter G1/4 female to Testpoint 16x2
- Case for HMG 500

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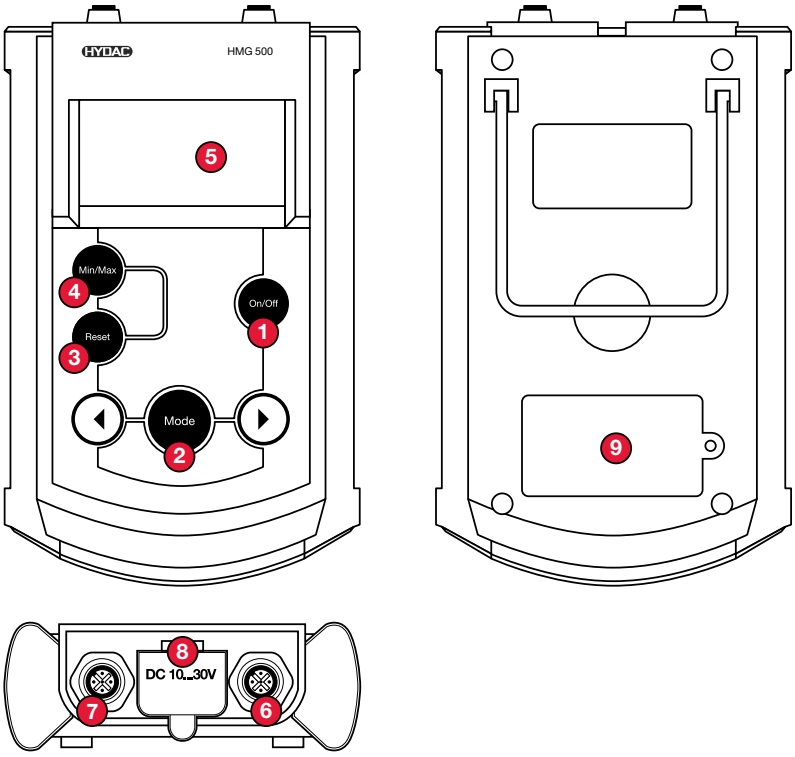
HMG Display Panel & Connections

1. **On/Off button**
2. **Mode**
   Adjusting the menus
3. **Reset**
   Resetting the min/max values
4. **Min/Max**
   Display of the minimum and maximum values
5. **Display**
6. **Sensor Input Connector** (Channel A)
7. **Sensor Input Connector** (Channel B)
8. **Protective Cover**
   Connection for AC adaptor
9. **Battery Compartment**



Diagnostic Unit

Model Code	Description	Part No.
HMG 500-000-E	Includes: • HMG 500-000-E with Manual • 9V Battery	00909101

Pressure Transducer with HSI

(HYDAC Sensor Interface)

Model Code	Description	Part No.
HDA 4748-H-0009-000	-15 to 131 psi (-1 to 9 bar)	00909429
HDA 4748-H-0016-000	0 to 232 psi (0 to 16 bar)	00909425
HDA 4748-H-0060-000	0 to 870 psi (0 to 60 bar)	00909554
HDA 4748-H-0100-000	0 to 1450 psi (0 to 100 bar)	00909426
HDA 4748-H-0250-000	0 to 3626 psi (0 to 250 bar)	00909337
HDA 4748-H-0400-000	0 to 5802 psi (0 to 400 bar)	00909427
HDA 4748-H-0600-000	0 to 8702 psi (0 to 600 bar)	00909428

Temperature Transducer with HSI

(HYDAC Sensor Interface)

Model Code	Description	Part No.
ETS 4548-H-000	-13° to 212°F (-25° to 100°C)	00909298

Flow Sensor with HSI *(HYDAC Sensor Interface)*

Model Code	Description - g/min (l/min)	Part No.
Aluminum		
EVS 3108-H-0020-000	0.3 to 5.3 (1.2 to 20)	00909405
EVS 3108-H-0060-000	1.6 to 15.9 (6 to 60)	00909293
EVS 3108-H-0300-000	4.0 to 79.3 (15 to 300)	00909404
EVS 3108-H-0600-000	10.6 to 159 (40 to 600)	00909403
Stainless Steel		
EVS 3118-H-0020-000	0.3 to 5.3 (1.2 to 20)	00909409
EVS 3118-H-0060-000	1.6 to 15.9 (6 to 60)	00909406
EVS 3118-H-0300-000	4.0 to 79.3 (15 to 300)	00909408
EVS 3118-H-0600-000	10.6 to 159 (40 to 600)	00909407

Accessories

Model Code	Description	Part No.
ZBE 30-02	cable for M12x1 - 2 meters	06040851
ZBE 30-05	cable for M12x1 - 5 meters	06040852
ZBE 34	M12x1 / Binder adaptor	03236597
ZBE 35	M12x1 / Hirschmann adaptor	03236601
ZBE 36	AS 1000 (Aqua Sensor) Adapter	00909737
ZBE 38	M12 Y-adaptor *(doubles the inputs)*	03224436
Plastic Case	for HMG 500 & accessories	06043006
Power Supply	24 VDC power supply	02702416

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HMG 510 Series

General

The HMG 510 Portable Data Recorder is a hand-held unit for simple measurement tasks on hydraulic and pneumatic systems. Typical applications are primarily to be found in analysis, maintenance and servicing.

The HMG 510 features two analog inputs. HSI sensors *(HYDAC Sensor Interface)* or SMART sensors can be connected to these inputs. HSI sensors are HYDAC sensors featuring automatic sensor recognition. Consequently, manual adjustments of the measurement range settings are no longer required.

Furthermore the HMG 510 is capable of measuring and displaying the differential between the values on channel A and B (channel A–B), providing two sensors featuring the same unit of measurement are connected.

In addition, the HMG 510 features a tare function enabling it to be zeroed.

The HMG 510 features a USB interface in addition to the HMG 500. The HMG 510 is also designed to work with the HYDACLab® and the CS1000 particle counter.

General Specifications

Items supplied:

- HMG 510
- Manual Ger/Eng/Fra
- 9 V battery
- USB cable
- Y adapter, blue *(for HLB 1000)*
- Y adapter, yellow *(for CS 1000)*
- Sensor cable M12x1 (2 m)
- CD-ROM with CMWIN software
- Case for HMG 510

Dimensions: 3.94 x 6.69 x 1.57 in. (100 x 170 x 40 mm)

Weight: 0.90 lbs (0.41 kg)

Operating/Ambient Conditions
Operating temperature: 41° - 122°F (5° to 60°C)
Storage temperature: -40° - 158°F (-40° to 70°C)
Relative humidity: 0 to 70 %

Power Supply
A standard 9V battery is sufficient for operation. The unit can also be operated using the AC mains adaptor plug listed under Accessories. If you have any questions, suggestions, or encounter any problems of a technical nature, please contact your HYDAC sales office.

Special Features

Adjustment function for mechanical pressure switches

Technical Details

Sensor inputs:
The HMG 510 features two analog inputs with automatic sensor detection at 2 input jacks *(channel A and B)*. Only HSI sensors *(pressure, temperature or flow rate transmitters)* and SMART sensors *(moisture, temperature and flow rate sensors)* can be connected.

Channel A and B:

- Automatic sensor recognition for HSI and SMART sensors; automatic setting of the measurement range and unit of measurement
- Measured value differential for channel A - B

Measurement accuracy of the input channels:

- ≤ +0.1% of the measurement range

Measurement rate:

- 0.1 ms

Measurement & Display:

- Current measured value
- Min/max values
- Measured value differential
- Change of the unit of measurement

Operating time using 9 V battery (2 sensors):

- approx. 10 hours

Standards with Which the HMG 510 Complies

- EMC: EN 61326-1+A1+A2
- Safety: EN 61010
- Protection rating: IP 54

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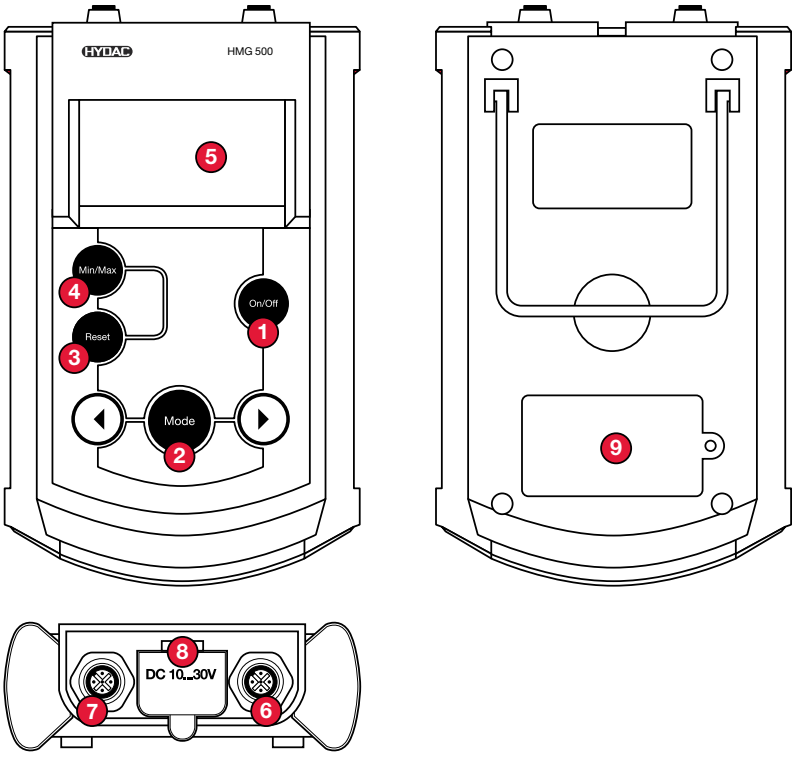
HMG Display Panel & Connections

1. **On/Off button**
2. **Mode**
   Adjusting the menus
3. **Reset**
   Resetting the min/max values
4. **Min/Max**
   Display of the minimum and maximum values
5. **Display**
6. **Sensor Input Connector** (Channel A)
7. **Sensor Input Connector** (Channel B)
8. **Protective Cover**
   Connection for AC adaptor and mini USB connection
9. **Battery Compartment**



Diagnostic Unit

Model Code	Description	Part No.
HMG 510-000-E	Includes: • HMG 510-000-E with Manual • 9V Battery • USB cable • Y adapter, blue *(for HLB 1000)* • Y adapter, yellow *(for CS 1000)* • Sensor cable M12x1 (2 m) • CD w/ CMWIN software • Case for HMG 510	00909889

Pressure Transducer with HSI

(HYDAC Sensor Interface)

Model Code	Description	Part No.
HDA 4748-H-0009-000	-15 to 131 psi (-1 to 9 bar)	00909429
HDA 4748-H-0016-000	0 to 232 psi (0 to 16 bar)	00909425
HDA 4748-H-0060-000	0 to 870 psi (0 to 60 bar)	00909554
HDA 4748-H-0100-000	0 to 1450 psi (0 to 100 bar)	00909426
HDA 4748-H-0250-000	0 to 3626 psi (0 to 250 bar)	00909337
HDA 4748-H-0400-000	0 to 5802 psi (0 to 400 bar)	00909427
HDA 4748-H-0600-000	0 to 8702 psi (0 to 600 bar)	00909428

Temperature Transducer with HSI

(HYDAC Sensor Interface)

Model Code	Description	Part No.
ETS 4548-H-000	-13° to 212°F (-25° to 100°C)	00909298

Flow Sensor with HSI *(HYDAC Sensor Interface)*

Model Code	Description - g/min (l/min)	Part No.
Aluminum		
EVS 3108-H-0020-000	0.3 to 5.3 (1.2 to 20)	00909405
EVS 3108-H-0060-000	1.6 to 15.9 (6 to 60)	00909293
EVS 3108-H-0300-000	4.0 to 79.3 (15 to 300)	00909404
EVS 3108-H-0600-000	10.6 to 159 (40 to 600)	00909403
Stainless Steel		
EVS 3118-H-0020-000	0.3 to 5.3 (1.2 to 20)	00909409
EVS 3118-H-0060-000	1.6 to 15.9 (6 to 60)	00909406
EVS 3118-H-0300-000	4.0 to 79.3 (15 to 300)	00909408
EVS 3118-H-0600-000	10.6 to 159 (40 to 600)	00909407

Accessories

Model Code	Description	Part No.
ZBE 30-02	cable for M12x1 - 2 meters	06040851
ZBE 30-05	cable for M12x1 - 5 meters	06040852
UVM 3000	Universal adapter	00909752
ZBE 26	Y adaptor, blue	03304374
ZBE 41	Y adaptor, yellow	00910000
USB Cable	Mini USB cable	06049553
USB Cable	Connection to PC	06040585
Power Supply	24 VDC power supply	02702416

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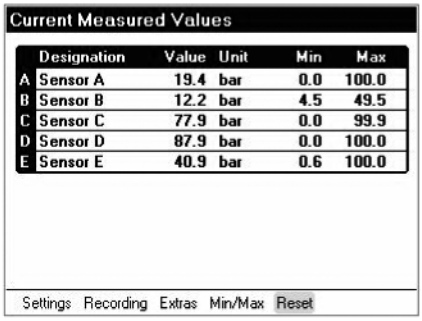
HMG 3000 Series

General

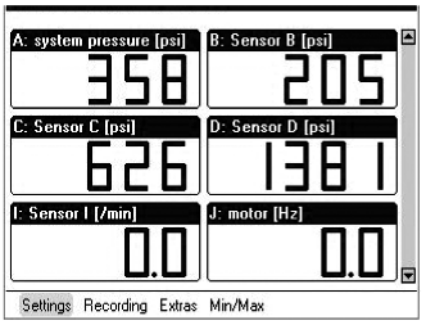
The HMG 3000 data recorder is a portable unit for simple measurement and data capturing tasks involving hydraulic and pneumatic systems. Applications extend primarily to maintenance and servicing, troubleshooting and test stands, as well as, quality inspecting.

The HMG 3000 can concurrently evaluate signals up to 10 sensors. The unit features 5 input jacks for connecting the sensors; if necessary this number can be doubled using a Y adapter for measurement operations involving more than 5 sensors. HYDAC offers matching HSI sensors *(HSI = HYDAC Sensor Interface)* for pressure, temperature and flow rate which are automatically recognized by the HMG 3000. Standard HYDAC sensors can also be used. However, these sensors do not feature any automatic sensor detection, consequently the initial setup has to be entered by hand.



Features

The HMG 3000 is user-friendly by virtue of its easy-access selection menus leading to all of the unit's functions and settings. The unit features a combination keypad for entering numeric values and text.



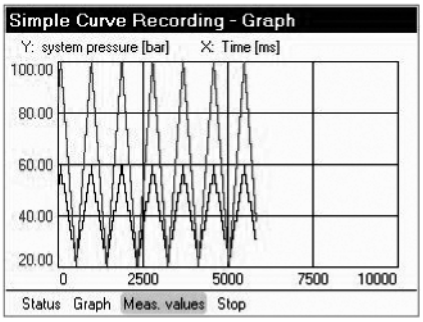
The HMG 3000 was designed in particular for capturing typical measurement values *(pressure, temperature, flow rate)* in hydraulic and pneumatic systems. A variety of other measurement tasks can be performed by virtue of additional inputs for voltage measurement. Example: checking the actuation of a switching valve or plotting the characteristic curve of a valve setpoint. In addition, it is also possible to determine differential values between the measured values of individual sensors. One example of this is taking a flow measurement using a differential pressure orifice plate.

In addition to the analog measurement inputs, the HMG 3000 features two digital inputs, enabling frequencies or speeds to be recorded, thus expanding the unit's range of potential applications.

When taking measurements of rapid, dynamic machine processes, all 8 analog input signals can be concurrently captured at a rate of 0.5 ms.

A special feature of the HMG 3000 is its ability to record measurements of highly dynamic processes in a machine. To this end, two input channels are featured which are capable of recording measured values at a rate of 0.1 ms. This feature is dependent on the use of suitable, fast-acting sensors.

Another feature offered by the HMG 3000 is its ability to record the dynamic processes of a machine in the form of a measurement curve and render them as a graph – on line and in real time.



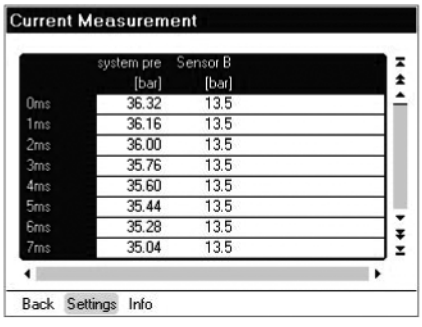
HMG Software

The HMG 3000 communicates with a computer via a USB or serial port. HYDAC offers HMGWIN 3000, the matching software for the HMG 3000, for convenient post-processing, rendering and evaluation of measurements at your computer. It also enables the HMG 3000 to be operated directly from your computer.

The HMG 3000 is equipped with specially developed software providing for fast data collection and processing. A measurement curve can comprise up to 500,000 measured values. The HMG 3000's measured value memory is capable of storing at least 100 of these measurement curves.

Display Options

In addition to enabling simple measurement curves to be recorded, the HMG 3000 also features other functions enabling event-driven measurements to be taken and event logs to be recorded. Various trigger options are available for triggering events.



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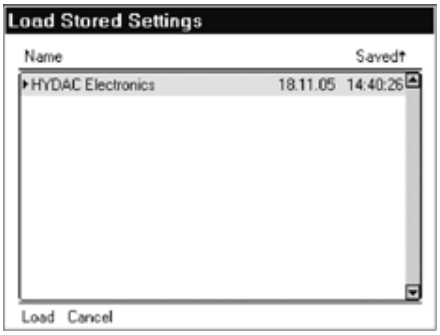
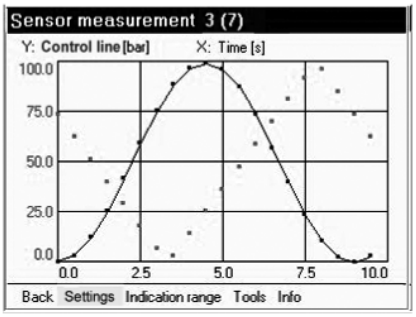
Apart from measurement curves, the HMG 3000 can store user-specific settings (user profiles). The main advantage of this is enabling identical measurements of various equipment items to be repeated for the purpose of preventive maintenance. All the user has to do is retrieve the respective user profile from the HMG 3000's memory.



The HMG 3000 features a 3.5" color full-graphics display enabling the measured values to be rendered in an easy-to-read form as text or a measurement curve. Individual measured values can be displayed in a large format (7-segment format), enabling them to be read at an extended distance.

The HMG 3000 also provides for a variety of user-friendly features for displaying, evaluating and processing measured values:

- Table
- Graph
- Scaling
- Ruler
- Tracker
- Zoom



Curve rendering: *Dotted* and *Dotted and solid*

Technical Details

Sensor Inputs	• 4 input jacks for 8 analog inputs *(channel A – H)* • 1 input jack for 2 digital inputs *(channel I – J)* • Voltage input of -10 V to 10 V *(shown at channel H)* • Connecting the sensors is done using a standard M12 x 1 plug connector *(5-pin)*.
Channel A to H	• Automatic detection for HSI sensors *(pressure, temperature, volumetric flow rate transducers)* • Connection of standard sensors with current or voltage signals • Differential channels for channel A – B; channel C – D

A & B:	**C & D:**	**E to G:**	**H:**
4 to 20 mA	4 to 20 mA	4 to 20 mA	4 to 20 mA
0 to 20 mA	0 to 20 mA	0 to 20 mA	0 to 20 mA
0 to 10 V	0 to 50 V		-10 to +10 V
0 to 5 V	0 to 10 V		
1 to 5 V	0 to 5 V		
1 to 6 V	1 to 5 V		
0.5 to 4.5 V	1 to 6 V		
0.5 to 5.5 V	0.5 to 4.5 V		
	0.5 to 5.5 V		

Channel I and J	Frequency channels *(speed (rpm) measurement, counting function)* Frequency range: 1 to 30 000 Hz Switching threshold: 2 V Maximum input voltage: 50 V
Sampling Rates *(The sampling rate which can be set is dependent on the active measurement channels.)* The following applies: • 0.1 ms = max. 2 analog input signals • 0.2 ms = max. 4 analog input signals • 0.5 ms = all 10 input channels	
Battery service times *(battery is fully charged)* • Without any sensors = ca. 11 hours • With 2 sensors = ca. 9 hours • With 4 sensors = ca. 7 hours • With 8 sensors = ca. 4 hours	**Measured Value Memory** Single recording: up to 500,000 measured values Archive memory: 64 MB *(for approx. 60 individual recordings consisting of 500,000 measured values each)*
PC Link Interfaces • USB port • Standard serial port (RS 232) for communication and evaluation using the HYDAC HMGWIN 3000 software	**Dimensions and Weight** • Measurements: 9.68 x 6.85 x 2.28 in. (246 x 174 x 58 mm) • Weight: 2.42 lbs. (1.10 kg)
Operating and Ambient Conditions • Operating temperature: 0 - 122°F (0 - 50°C) • Storage temperature: -4 - 140°F (-20 - 60°C) • Relative humidity: 0 - 70 %	**Standards with which the HMG 3000 Complies** • EMC: EN 6000-6-1, EN 6000-6-2, EN 6000-6-3, EN 6000-6-4 • Safety: EN 61010 • Protection type/rating: IP40

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HMG Display Panel & Connections

1. **On/Off** button
2. **Brightness/contrast setting** of the display
3. **ESC key**
   For canceling an entry or going Back step by step
4. **Shift key**
   Switches the numpad to a textpad when pressed; the textpad is active only as long as the Shift key is pressed.
5. **Keypad**
   Numbers and letters can be entered via the combination keypad in a fashion similar to that of mobile phones.

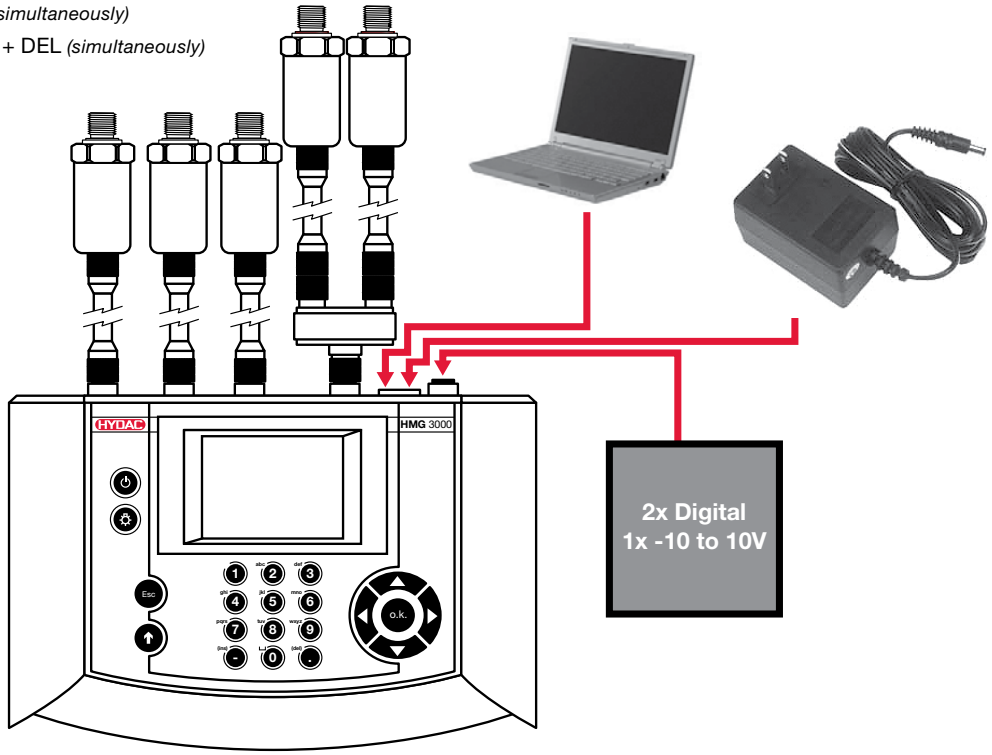
   Numbers: 0 to 9; "." *(decimal separator)* and "-" *(minus)*

   Text Entry: Capital ABC's and Lower case abc's
   INS = insert; **DEL** = delete;

   Entry of spaces: SHIFT + INS *(simultaneously)*

   Deletion of characters: SHIFT + DEL *(simultaneously)*
6. **Graphic display**
   Display of the menu and operating functions, measured values and measurement curves
7. **5-way navigation key**
   For navigating step by step in the display **OK** key for inputting, concluding, accepting or storing an entry

Tip: To accept characters: release the Shift key or press the right arrow of the 5-way navigation key.



Connections

A - D & E - H 4 sensor input jacks for up to 8 sensors with an analog signal (channel A – D and E – H*), e.g. for sensors for measuring pressure, temperature or flow rate.

The 4 input jacks can be doubled by plugging in Y adapters.

* Channel H can be used for sensors with an analog signal as well as for voltage measurements of -10V to 10V.

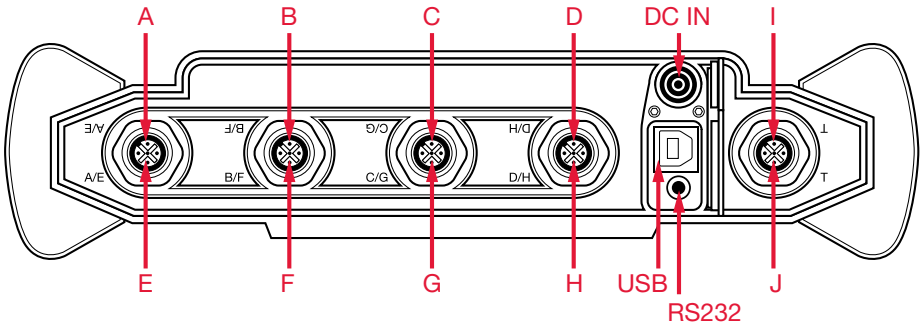
I / J 1 or 2 input jacks for:

- 2 digital signals, e.g. for frequency or speed measurements (channel I, J)
- 1 voltage input (-10V to 10V, channel H*)

DC IN Female connector for power supply

USB 1 USB connector

RS232 1 serial port



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Diagnostic Unit

Model Code	Description	Part No.
HMG 3000-000-E	Includes: • HMG 3000-000 with Manual • Battery Set & Charging Unit • HMGWIN software incl. USB cable	02084116

Pressure Transducer with HSI

(HYDAC Sensor Interface)

Model Code	Description	Part No.
HDA 4748-H-0009-000	-15 to 131 psi (-1 to 9 bar)	00909429
HDA 4748-H-0016-000	0 to 232 psi (0 to 16 bar)	00909425
HDA 4748-H-0060-000	0 to 870 psi (0 to 60 bar)	00909554
HDA 4748-H-0100-000	0 to 1450 psi (0 to 100 bar)	00909426
HDA 4748-H-0250-000	0 to 3626 psi (0 to 250 bar)	00909337
HDA 4748-H-0400-000	0 to 5802 psi (0 to 400 bar)	00909427
HDA 4748-H-0600-000	0 to 8702 psi (0 to 600 bar)	00909428

Temperature Transducer with HSI

(HYDAC Sensor Interface)

Model Code	Description	Part No.
ETS 4548-H-000	-13° to 212°F (-25° to 100°C)	00909298

Additional Sensors

Model Code	Description	Part No.
HDS 1000-002	RPM Sensor (plug M12x1) 2M Includes HDS 1000 Reflector Set (part no. 00904812)	00909436
HDS 1000 Reflector Set	Reflective foil set 25 pieces	00904812
SSH 1000	Sensor simulator for 2 HSI *(ideal for training purposes)*	00909414

Flow Sensor with HSI *(HYDAC Sensor Interface)*

Model Code	Description - g/min (l/min)	Part No.
Aluminum		
EVS 3108-H-0020-000	0.3 to 5.3 (1.2 to 20)	00909405
EVS 3108-H-0060-000	1.6 to 15.9 (6 to 60)	00909293
EVS 3108-H-0300-000	4.0 to 79.3 (15 to 300)	00909404
EVS 3108-H-0600-000	10.6 to 159 (40 to 600)	00909403
Stainless Steel		
EVS 3118-H-0020-000	0.3 to 5.3 (1.2 to 20)	00909409
EVS 3118-H-0060-000	1.6 to 15.9 (6 to 60)	00909406
EVS 3118-H-0300-000	4.0 to 79.3 (15 to 300)	00909408
EVS 3118-H-0600-000	10.6 to 159 (40 to 600)	00909407

Accessories

Model Code	Description	Part No.
USB Cable	Connection to PC	06040585
ZBE 30-02	cable for M12x1 - 2 meters	06040851
ZBE 30-05	cable for M12x1 - 5 meters	06040852
ZBE 31	Car Charger for HMG 3000	00909739
ZBE 34	M12x1 / Binder adaptor	03236597
ZBE 35	M12x1 / Hirschmann adaptor	03236601
ZBE 36	AS 1000 (Aqua Sensor) Adapter	00909737
ZBE 38	M12 Y-adaptor *(doubles the inputs)*	03224436
ZBE 41	Yellow Y Adapter	00910000
Hydraulic Adaptor Set *(2 pieces each)*	Adapter hose DN 2 / 1620/1620, 400mm and 1000 mm, pressure gauge connectors 1620 / G1/4, adapter 1615/1620, bulkhead couplings 1620/1620	00903083
UVM 3000	Universal connection module for HMG 3000	00909752
Bag	with carry strap	00909795
Aluminum Case	for HMG 3000 and accessories	06042959
Power Supply	DC Charging unit for HMG 3000	06054296

HYDAC HSI sensors are part of a new plug and play, self-identifying sensor line. HSI sensors must be used with the HMG 500 and facilitate easy use with the HMG 3000. The HMG 3000 is capable of reading standard sensors as well as competitive models.

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OFS Series
Filtration Station

Description

The HYDAC Filtration System (OFS) is capable of flushing, filtering, and monitoring ISO cleanliness with user-defined, automatic features. **The OFS is designed to transfer fluid through two filters in series for staged particulate or water/particulate removal.** Both filters are top-loading and include element indicators in the cap. A particle monitor reads samples from the pump discharge and displays ISO contamination codes on the control panel. The monitor allows the user to input the desired ISO cleanliness codes for the fluid. In auto mode, the system will run until the cleanliness codes are reached. Upon reaching the codes, the pump will stop and the cycle complete light will come on. When in manual mode, the system will run continuously and display the ISO codes. A water sensor is available for providing the water saturation of the fluid, both displayed on the control panel.

Features

- Real time monitoring of ISO cleanliness classes
- Automatic shutdown when user defined ISO codes are reached
- USB port allows the ISO code data to be downloaded for further processing and/or printing
- 30 mesh suction strainer and 230 micron filter and included to protect the particle monitor from clogging
- The AS1000 allows real-time water saturation and temperature values of the fluid to be displayed
- Bypass valve so cart can be used as a transfer cart
- Single lift point
- Plastic removable drip pan

Applications

- **In-Plant Service** – Filter to desired cleanliness levels and extend component life
- **Mobile Dealer Networks** – Aid in certified re-builds, service maintenance contracts and total maintenance & repair programs
- **Original Equipment Manufacturer** – Filter to required roll-off cleanliness levels
- **Lubricant Reclamation/Recycling** – Clean oil to extend oil life and reduce hazardous waste

Technical Details

Flow Rating	9 gpm *(AC option)*; 3-8 gpm *(DC option)*
Motor	1 1/2 HP, 115/220VAC motor *(AC option)* 1 HP, 90VDC Variable speed *(DC option)*
Viscosity	1000 SUS (230cSt)
Operating Temperature	-20° F to 150° F (-29° C to 65° C)
Bypass Valve Setting	Cracking: 30 psi (2 bar) x 2
Compatibility	All petroleum based hydraulic fluid. *(Contact factory for use with other fluids.)*
Element Change Clearance	18" or 27" *(depending on model configuration)*
Weight	245 lbs (112 kg)

Element Performance

Micron Rating	Filtration Rating per ISO 4572/NFPA T3.10.8.8 *Using automated particle counter (APC) calibrated per ISO 4402*			Filtration Rating wrt ISO 16889 *Using APC calibrated per ISO 11171*	
Element	Bx≥75	Bx≥100	Bx≥200	Bx≥200	Bx≥1000
5	2.5	3.0	4.0	4.8	6.3
10	7.4	8.2	10.0	8.0	10.0
25	18.0	20.0	22.5	19.0	24.0

Dirt Holding Capacity

9" Element Micron Rating	DHC(gm)	18" Element Micron Rating	DHC(gm)
5	119	5	238
10	108	10	216
25	93	25	186

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Model Code

OFS - A - 1 - 09 - BN - 10 - BN - 01 - V - 9 - W

Series
OFS = Filtration Station

Voltage
A = 120VAC 60 Hz
B = 220 VAC 60 Hz
C = 220 VAC 50 Hz
(A plug is not provided for these options.)

Number of Elements *(18" and 27" housings only)*
1 = Element length must be either 18" or 27"
2 = Two 9" elements per 18" housing
3 = Three 9" elements per 27" housing

Element Length *(18" and 27" housings only)*
09 = Two 9" elements per 18" housing
Three 9" elements per 27" housing
18 = One 18" element per 18" housing
27 = One 27" element per 27" housing

Element Media
BN = Betamicron®
AM* = Aquamicron®

Filtration Rating *(BN only - AM has no rating) (microns)*
01, 03, 05, 10, 25

Element Media
BN = Betamicron®
AM* = Aquamicron®

Filtration Rating *(BN only - AM has no rating) (microns)*
01, 03, 05, 10, 25

Seals
V = Fluoroelastomer (FPM)
B = Buna N

Pump Size *(gpm)*
9 = Gear Pump, 9 gpm
DC = DC Drive, variable flow, 3-8 gpm

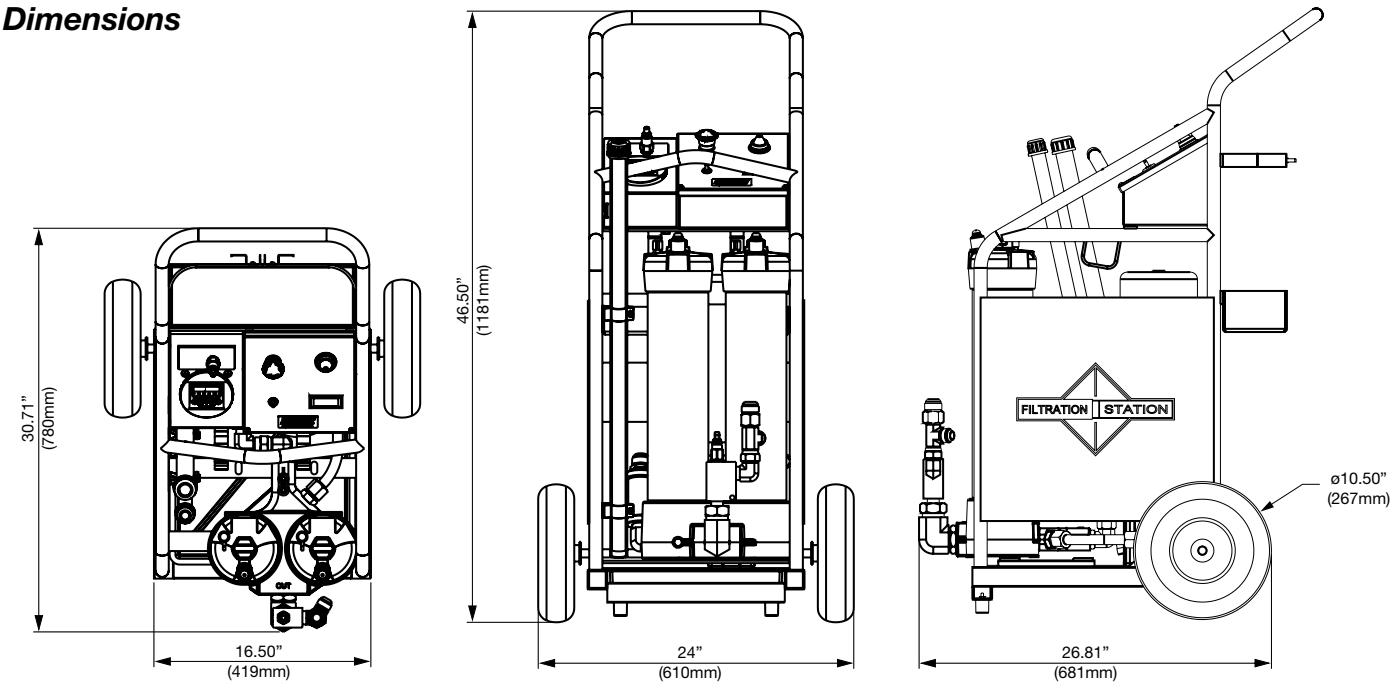
Options
W = AS1000 Water Sensor

*Aquamicron media should be in the first filter housing followed by the BN media in the second housing.

For replacement element part numbers, please see page 69 of this catalog

Model Codes Containing RED are non-standard items – Minimum quantities and longer lead times may apply - Contact HYDAC for information and availablity.

Dimensions



Dimensions are for general information only, all critical dimensions should be verified by requesting a certified print.

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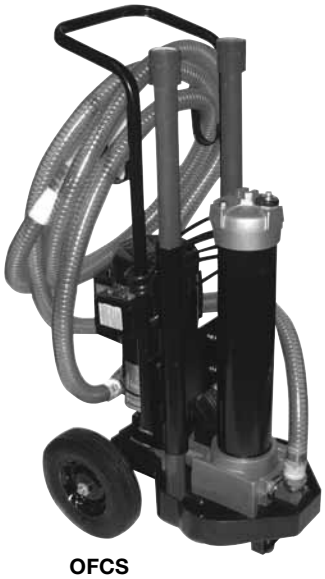
OFCS & OFCD Series

Single & Dual Stage Filtration Systems

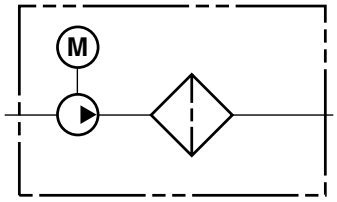


OFCS

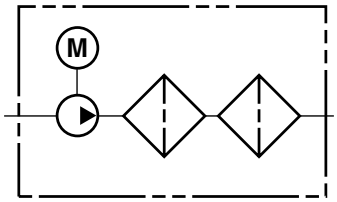
OFCD

Hydraulic Symbol

OFCS Series



OFCD Series



Description

The OFCS and OFCD Series are compact, self-contained filtration system equipped with high efficiency, high capacity elements capable of removing particulate contamination and/or water quickly, conveniently and economically. It is perfect for cleaning up existing systems as well as for prefiltering new fluids, since new fluids often have contamination levels significantly higher than that recommended for most hydraulic systems.

The most attractive feature of the new OFCS and OFCD Series is the significant reduction in noise, being reduced from 91 decibels to 72 decibels at full load. Additional improvements include a modular base that eliminates hoses and fittings between components, a drip pan, and easier element servicing.

The OFCS single filtration unit can remove either water or particulate contamination. The OFCD dual filtration unit can be used to remove both water and particulate contamination, or for staged particulate contaminant removal.

Features

- Modular base eliminates hoses between components and minimizes leakage
- Base-ported filter provides easy element service from the top cap
- Cleans up oil faster – 7 gpm and 14 gpm models available
- Ten-foot hose and extension tubes included
  Viton® available *(1" dia. for 7 gpm; 1.25" dia. for 14 gpm)*
- Drip pan catches oil before it falls to the ground
- Integral suction strainer protects pump
- Off-line stationary system available
- 27" Housing Standard

Applications

- Supplementing continuous filtration by system filters
- Cleaning up a hydraulic system following component replacement
- Filtering new fluid before it is put into service
- Transferring fluid from storage tanks and drums to system reservoirs

Technical Details

Flow Rating	7 gpm max or 14 gpm max	
Maximum Viscosity	1000 SUS (216 cSt) Higher viscosity version available.	
Hose Pressure Rating	30 psig (2.0 bar) @ 150°F (65.6°C) Full vacuum @ 150°F (65.6°C)	
Maximum Operating Temperature	-20° to 150°F (-29° to 65°C)	
Bypass Valve Setting	Cracking: 30 psi (2 bar)	
Material	Manifold and cap: Cast aluminum Element case: Steel	
Compatibility	All petroleum based hydraulic fluid. Contact factory for use with other fluids.	
Motor	115 V AC Single phase 3/4 hp (7 gpm) or 1-1/2 hp (14 gpm)	
Weight - lbs (kg) 7 gpm 14 gpm	OFCS 190 (86) 197 (89)	OFCD 220 (100) 227 (103)

Replacement Elements

Model Code	Part No.	Model Code	Part No.
5.03.09D03BN	02060528	5.03.27D03BN	02065003
5.03.09D03BN/-V	02056713	5.03.27D03BN/-V	02082855
5.03.09D05BN	02060529	5.03.27D05BN	02065004
5.03.09D05BN/-V	02056714	5.03.27D05BN/-V	02073488
5.03.09D10BN	02060530	5.03.27D10BN	02065005
5.03.09D10BN/-V	02056715	5.03.27D10BN/-V	02056493
5.03.09D20BN	02060531	5.03.27D20BN	02065006
5.03.09D20BN/-V	02056716	5.03.27D20BN/-V	C/F
5.03.09D10AM	02075265	HK/HJ *(connector element)*	02056730

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Model Code

OFCD __ - 27 - BN 10 - BN 10 - B - 14

Series
- OFCS = Single Filter System
- OFCD = Dual Filter System

Pneumatic Option
- *(omit)* = Electric motor *(standard)*
- P = Pneumatic motor only

Element Length
- 1-09 = One 9” Elements Supplied
- 2-09 = Two 9” Elements Supplied *(must be same micron rating)*
- 3-09 = Three 9” Elements Supplied *(must be same micron rating)*
- 18 = One 18” Element Supplied
- 27 = One 27” elements supplied

Filter Media
- BN = Betamicron® Low Collapse
- AM* = Aquamicron® Water Removal

Filtration Rating *(BN only - AM has no rating) (microns)*
- 3
- 5
- 10
- 20

Betamicron® (BN/HC) Absolute Filtration Rating ($\beta_{x(c)} \geq 1000$)

Filter Media *(OFCD only)*
- BN = Betamicron® Low Collapse
- AM* = Aquamicron® Water Removal

Filtration Rating *(BN only - AM has no rating) (microns) (OFCD only)*
- 3
- 5
- 10
- 20

Betamicron® (BN/HC) Absolute Filtration Rating ($\beta_{x(c)} \geq 1000$)

Seals
- B = Buna N
- V = FPM

Pump Size
- 07 = 7 gpm
- 14 = 14 gpm

NOTE: Higher Viscosity versions are available, please contact factory for details

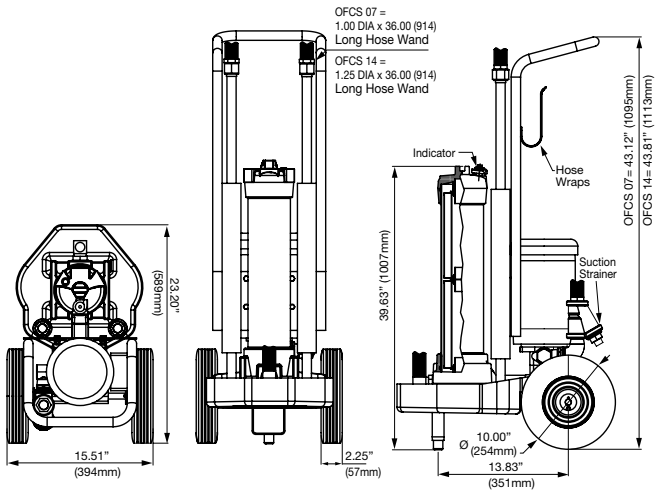
*Aquamicron media should be in the first filter housing followed by the BN media in the second housing.

For replacement element part numbers, please see page 69 of this catalog.

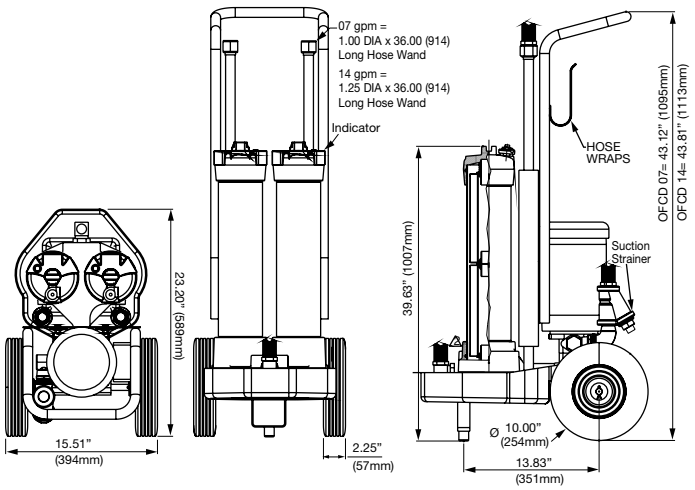
Model Codes Containing RED are non-standard items – Minimum quantities and longer lead times may apply - Contact HYDAC for information and availablity

Dimensions

OFCS Series



OFCD Series



Dimensions are for general information only, all critical dimensions should be verified by requesting a certified print.

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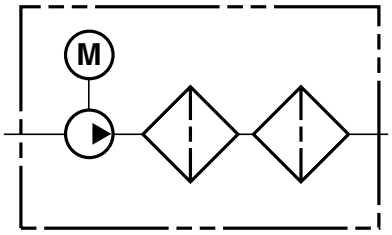
OFCD HV Series

Compact Dual Stage Filtration System for High Viscosity

Hydraulic Symbol



Description

A great product just got better! HYDAC's newest addition to the portable filtration carts offers the user the ability to filter high viscosity fluids.

The OFCD-HV is a compact, self-contained filtration system equipped with high efficiency, high capacity elements capable of removing particulate contamination and/or water quickly, conveniently and economically. It is perfect for cleaning up existing systems as well as for prefiltering new fluids, since new fluids often have contamination levels significantly higher than that recommended for most hydraulic systems.

The OFCD-HV dual filtration unit can be used to remove both water and particulate contamination or for staged particulate contamination removal. Additional features include a modular base that eliminates hoses and fittings between components, a drip pan and easier element servicing.

Features

- An integrated lifting eye option for lifting the OFCD-HV up into the Wind Tower
- Ability to filter fluids having a viscosity up to 10,000SUS
- Modular base eliminates hoses between components and minimizes leakage
- Base-ported filter provides easy element service from the top cap
- Ten-foot hose and extension tubes included
- Dip pan catches oil before it falls to the ground
- 18-inch housing is standard

Applications

- Cleaning high viscosity fluids used in Wind applications
- Supplementing continuous filtration by systems filters
- Cleaning up a hydraulic system following component replacement
- Filtering new fluid before it is put into service
- Transferring fluid from storage tanks and drums to system reservoirs

Technical Details

Flow Rating	Maximum 3 gpm
Maximum Viscosity	10,000SUS
Hose Pressure Rating	30 psig (2.0 bar) @ 150°F (65°C) Full vacuum @ 150°F (65°C)
Maximum Operating Temperature	-20° to 150°F (-29° to 65°C)
Bypass Valve Setting	Cracking: 40 psi (2.8 bar)
Material	Manifold and Cap: Cast Aluminum Element case: Steel
Compatibility	All petroleum based hydraulic fluid. Contact factory for use with other fluids
Motor	115V AC Single phase, 1.5 HP

Replacement Elements

Model Code	Part No.
5.03.18D03BN	02060430
5.03.18D03BN/-V	02071680
5.03.18D05BN	02060431
5.03.18D05BN/-V	02056457
5.03.18D10BN	02060432
5.03.18D10BN/-V	02056492
5.03.18D25BN	02060433
5.03.18D25BN/-V	02072428
5.03.27D03BN	02065003
5.03.27D03BN/-V	02082855
5.03.27D05BN	02065004
5.03.27D05BN/-V	02073488
5.03.27D10BN	02065005
5.03.27D10BN/-V	02056493
5.03.27D20BN	02065006
5.03.27D20BN/-V	TBD
5.03.27D40AM	02088358

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Model Code

OFCD - 18 - BN 10 - BN 10 - B - G2597

Series
OFCD = Dual Filter System

Element Length
18 = One 18" element supplied per housing
27 = One 27" elements supplied per housing

Filter Media
BN = Betamicron® Low Collapse
AM* = Aquamicron® Water Removal

Filtration Rating *(BN only - AM has no rating) (microns)*
3
5
10
20
Betamicron® (BN/HC)
Absolute Filtration Rating
($\beta_{x(c)} \geq 1000$)

Filter Media
BN = Betamicron® Low Collapse
AM* = Aquamicron® Water Removal

Filtration Rating *(BN only - AM has no rating) (microns)*
3
5
10
20
Betamicron® (BN/HC)
Absolute Filtration Rating
($\beta_{x(c)} \geq 1000$)

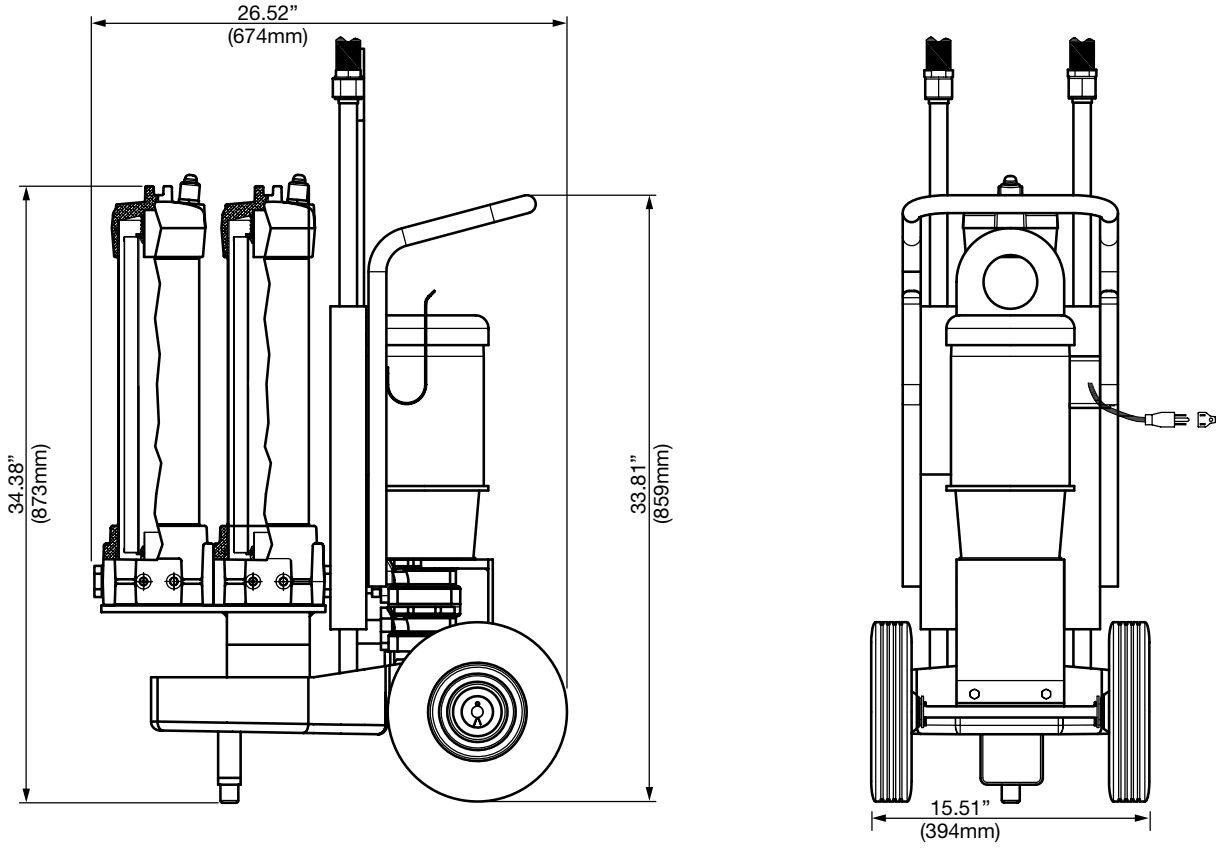
Seals
B = Buna N
V = FPM

Options
G2597 = High viscosity filter cart; total cart height is 35 inches *(18" filter cart only)*
G2538 = High Viscosity Filter Cart with Balanced Lifting Eye
G2502 = High Viscosity Filter Cart
(27" filter cart only)

*Aquamicron media should be in the first filter housing followed by the BN media in the second housing.

For replacement element part numbers, please see page 69 of this catalog.

Dimensions



Dimensions are for general information only, all critical dimensions should be verified by requesting a certified print.

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OFAS & OFAD Series

Single & Dual Stage Air-Operated Kidney Loop Systems

OFAS

Description

HYDAC now offers a kidney loop filtration system with a pneumatic motor in place of the standard electric motor. The pneumatic motor offers the same flow capability using the same components, but without the need for an electrical outlet. This provides a major advantage in the application of this unit. With no need for an electrical outlet, it is more portable than the standard electric-motored skids and carts.

Because most trucks and industrial machinery are already equipped with an air compressor, a simple connection to the 1/4" NPT port will easily power the 1.5 HP (or 4.0 HP) motor. At 70 psi, and 2000 rpm, this motor consumes less than 40 cfm (70 cfm for the 4.0HP motor) of compressed air. Because no electricity is used, the pneumatic motor is ideal for working in hazardous environments such as mines.

Applications

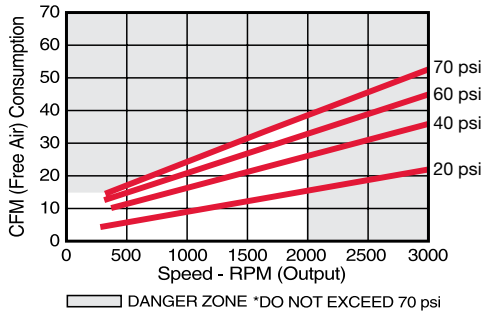
- Supplementing in-line filtration by system filters when adequate turnover cannot be attained
- Large volume systems requiring multiple filters in different locations
- Cleaning up a hydraulic system following component replacement
- Ideal location for water removal
- Field applications on service trucks

Technical Details

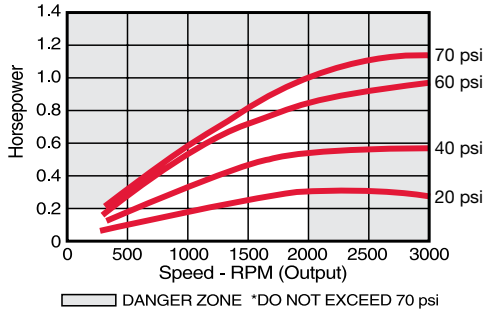
Flow Rating	7 gpm (26.5 L/min) max and 14 gpm (53.0 L/min) max
Maximum Viscosity	1000 SUS (216 cSt) Higher viscosity version available. Contact factory for details
Maximum Operating Temperature	-20° to 150°F (-29° to 65°C) For higher temperature applications contact factory.
Bypass Valve Setting	Cracking: 30 psi (2 bar)
Material	Manifold and cap: Cast aluminum Element case: Steel
Compatibility	All petroleum based hydraulic fluid. Contact factory for use with other fluids.
Element Change Clearance	9", 18" or 27" *(depending on model configuration)*

Performance

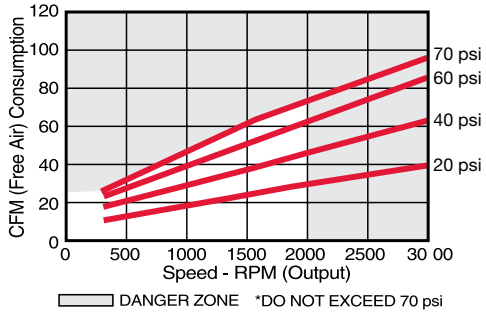
7 GPM AIR MOTOR
Air Consumption vs. Speed



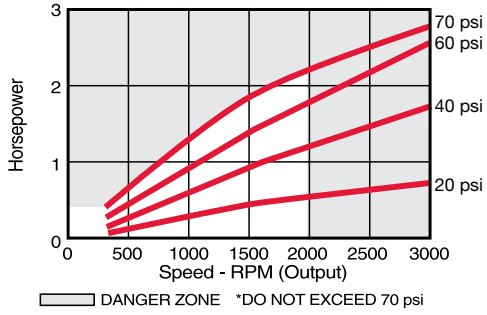
7 GPM AIR MOTOR
Output vs. Speed



14 GPM AIR MOTOR
Air Consumption vs. Speed



14 GPM AIR MOTOR
Output Power vs. Speed



Note: Performance data represents a 4-vane model with no exhaust restriction.

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Model Code

OFAD 2 - 09 - BN 10 - BN 10 - B - 14

Series
OFAS = Air Operated Single Filter System
OFAD = Air Operated Dual Filter System

Number of Elements
1, 2 *(size 09 only)*, 3 *(size 09 only)*

Element Length
09 = One 9” elements supplied
18 = One 18” elements supplied
27 = One 27” elements supplied

Element Media
BN = Betamicron®
AM* = Aquamicron®

Filtration Rating *(BN only - AM has no rating) (microns)*
3, 5, 10, 25

Element Media *(OFAD only)*
BN = Betamicron®
AM* = Aquamicron®

Filtration Rating *(BN only - AM has no rating) (microns)*
3, 5, 10, 25

Seals
B = Buna N

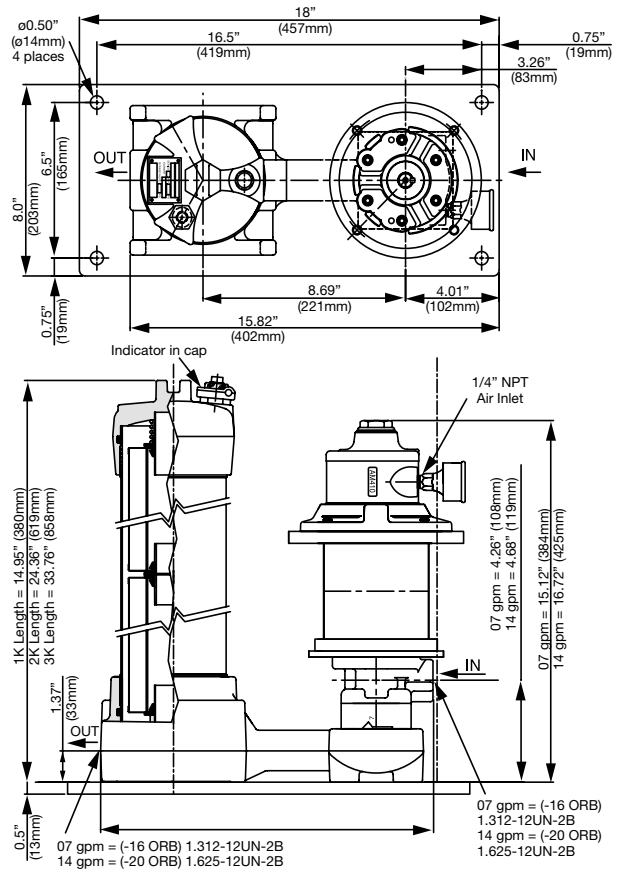
Pump Size
07 = 7 gpm
14 = 14 gpm

NOTE: When OFAS/ODAD is ordered, the number of elements, element length and seals will be identical for both filter housings.
*Aquamicron media should be in the first filter housing followed by the BN media in the second housing.

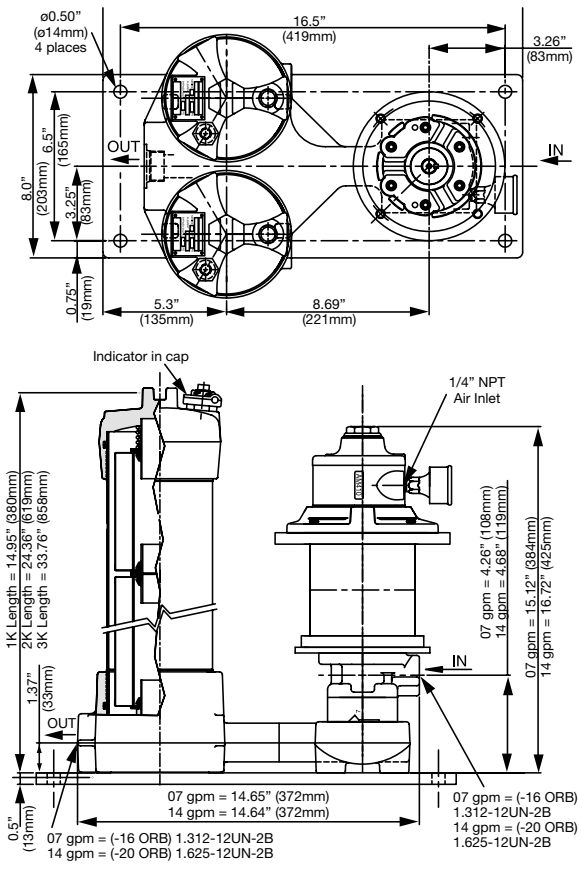
For replacement element part numbers, please see page 69 of this catalog.

Dimensions

OFAS



OFAD



Dimensions are for general information only, all critical dimensions should be verified by requesting a certified print.

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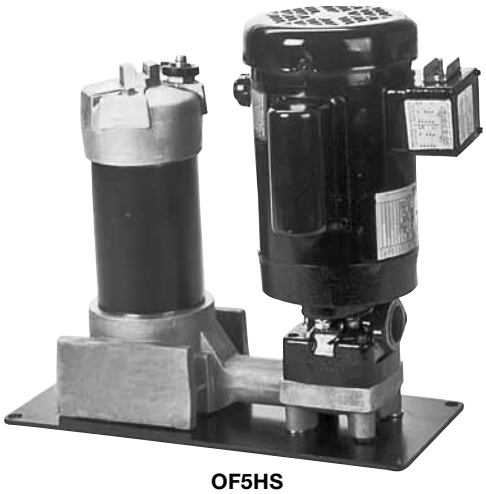
OF5HS & OF5HD Series
Single & Dual Stage Kidney Loop Systems

OF5HD



OF5HS

Description
HYDAC's off-line Kidney Loop System is a stationary version of the Mobile Filtration System. It is a compact, self-contained filtration system equipped with high efficiency, high capacity elements capable of removing particulate contamination and/or water quickly, conveniently and economically. This off-line system can be used to supplement in-line filters when adequate turnover cannot be achieved in the system. It is also ideal for water removal. Like the Mobile Filtration System, the new OF5H Series operates at a surprisingly low noise level. Its modular base eliminates hoses and fittings between components. The OF5HS single filtration unit can remove either water or particulate contamination. The OF5HD dual filtration unit can be used to remove both water and particulate contamination, or for staged particulate contaminant removal.

Features
- Modular base eliminates connections between components and minimizes leakage
- Base-ported filter provides easy element service from the top cap
- Single, double and triple bowl length option allows the flexibility of additional dirt-holding capacity
- Visual Dirt Alarm indicates when filter element needs changed
- Two 7/16 – 20 UNF sampling port included on all models

Applications
- Supplementing in-line filtration by system filters when adequate turnover cannot be attained
- Large volume systems requiring multiple filters in different locations
- Cleaning up a hydraulic system following component replacement
- Ideal location for water removal

Technical Details

Flow Rating	7 gpm max or 14 gpm max
Maximum Viscosity	1000 SUS (216 cSt) Higher viscosity version available.
Maximum Operating Temperature	-20° to 150°F (-29° to 65°C)
Bypass Valve Setting	Cracking: 30 psi (2 bar)
Material	Manifold and cap: Cast aluminum Element case: Steel
Compatibility	All petroleum based hydraulic fluid. Contact factory for use with other fluids.
Motor	115 V AC Single phase 3/4 hp (7 gpm) or 1-1/2 hp (14 gpm)
Weight	OF5HS-1: 101 lb (45.9 kg) OF5HS-2: 112 lb (50.9 kg) OF5HS-3: 123 lb (55.9 kg) OF5HD-1: 117 lb (53.2 kg) OF5HD-2: 139 lb (63.2 kg) OF5HD-3: 161 lb (73.2 kg)

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Model Code

OF5HD 1 - 09 - BN 10 - BN 10 - B - 14 - _

Series
OF5HS = Single Filter System
OF5HD = Dual Filter System

Number of Elements
1, 2 *(size 09 only),* 3 *(size 09 only)*

Element Length
09 = One 9” elements supplied
18 = One 18” elements supplied
27 = One 27” elements supplied

Element Media
BN = Betamicron® AM* = Aquamicron®

Filtration Rating *(BN only - AM has no rating) (microns)*
3, 5, 10, 25

Element Media *(OF5HD only)*
BN = Betamicron® AM* = Aquamicron®

Filtration Rating *(BN only - AM has no rating) (microns)*
3, 5, 10, 25

Seals
B = Buna N V = FPM

Pump Size
07 = 7 gpm
14 = 14 gpm

Options
xx = High viscosity version *(Contact factory for available options.)*

NOTE: When OF5HS/OF5HD is ordered, the number of elements, element length and seals will be identical for both filter housings. Contact factory if EPR seals are required.

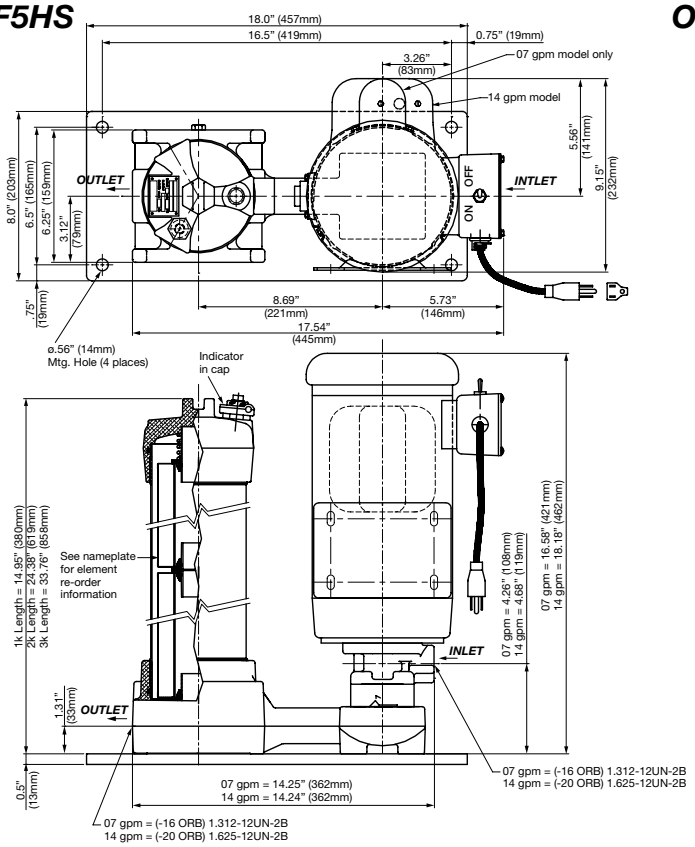
*Aquamicron media should be in the first filter housing followed by the BN media in the second housing.

For replacement element part numbers, please see page 69 of this catalog.

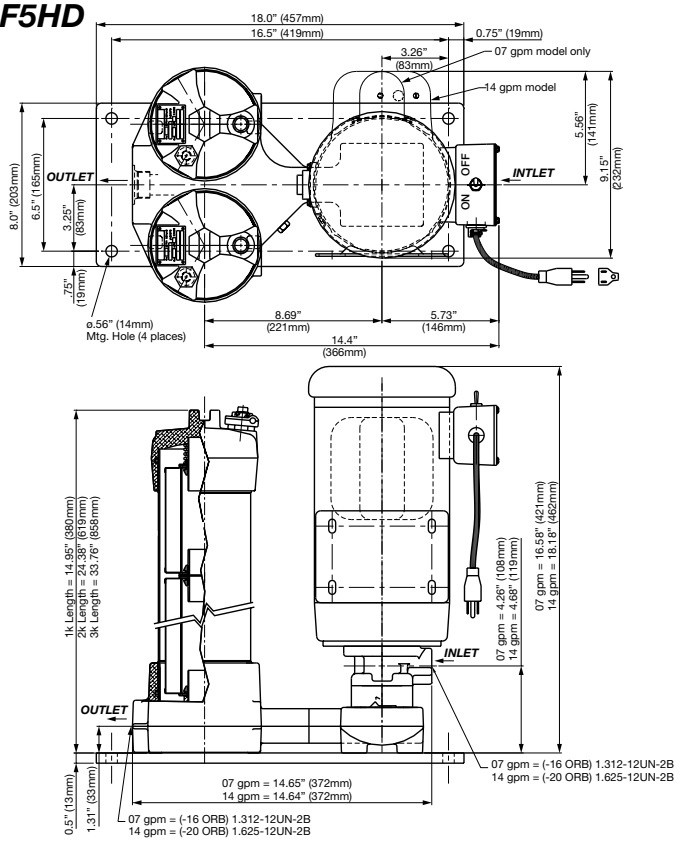
Model Codes Containing RED are non-standard items – Minimum quantities and longer lead times may apply - Contact HYDAC for information and availablity.

Dimensions

OF5HS



OF5HD



Dimensions are for general information only, all critical dimensions should be verified by requesting a certified print.

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OFX Series
Filter Skids

Single OFX

Description

HYDAC's new OFX Series filtration skids are compact, self-contained filtration systems equipped with high efficiency, high capacity elements capable of removing particulate contamination and/or water quickly and economically. They supplement in-line filters whenever the existing filtration is incapable of obtaining the desired ISO cleanliness level.

It is not uncommon for viscosity to be overlooked when specifying an off-line filtration unit. The results of this oversight can severely affect system efficiency and longevity, and render the filtration system useless when high viscosity fluid causes the filter to be in constant bypass. HYDAC considers maximum fluid viscosity, *(at the minimum operating temperature)* in conjunction with flow to properly size the pump and motor.

Standard OFX Series OFX1 – OFX6 skids include a hydraulic pump, electric motor, and either a single or dual standard capacity or high capacity housing. Many different component combinations provide the flexibility to match specific system viscosity, flow, and cleanliness requirements. Multiple housing lengths give the option of adding additional dirt holding capacity.

HYDAC's high viscosity OFX Series skids, OFX7 & OFX8, are designed to handle fluids that have a viscosity as high as 25,000 SUS. The skids have 39" long high capacity filters to efficiently clean the viscous fluids. The filters have a high dirt-holding capacity, capable of holding almost 1000 grams of dirt depending on the element. OFX7 & OFX8 Series skids include a pump, motor, high capacity filter, suction strainer, and dirt indicator. Various options can account for specific user needs.

Features

- Protects and extends the life of expensive components
- Minimizes downtime and maintenance costs
- Designed to handle high viscosity oils up to 25,000 SUS *(see Skid Selection)*
- Many component combinations and variable starter options allow the flexibility to match specific user needs
- Four wheel cart option provides product portability
- Integral drip pan with drain plug prevents oil from spilling on ground
- Sample valves provided at filter base for fluid sampling
- Market leading HYDAC Betamicron® synthetic filtering media provides for quick, efficient clean up with maximum element life

Technical Details

Flow Rating	Up to 82 gpm (310 L/min)
Temp. Range	0°F to 180°F (-17°C to 82°C)
Bypass Valve Setting	50 psi (3.5 bar) for skid series OFX1, OFX2, OFX3, OFX4, OFX5, OFX7 & OFX8 40 psi (2.8 bar) for skid series OFX6
Fluid Viscosity	Up to 25,000 SUS *(see Skid Selection)*
Compatibility	All petroleum based hydraulic fluids. Contact HYDAC for use with other fluids, including ester and skydrol
Pump	OFX1-OFX6: Continuous duty gear pump with integral 150 psi relief. Flow dependent on skid series and motor. *(Refer to Pump, Motor & Weight Data table)* OFX7-OFX8: Positive displacement rotary screw-pumps.
Motor	Horsepower dependent on skid series and flow. *(Refer to Pump, Motor & Weight Data table)*
Porting	Dependent on flow. *(Refer to Porting Data table)*

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Skid Selection

Series	Viscosity Range	Filter Housing(s)	Maximum Flow
OFX1	150 - 500 SUS	(1) High Capacity or Standard Capacity	82 gpm (310 lpm)
OFX2	500 - 2000 SUS	(1) High Capacity or Standard Capacity	82 gpm (310 lpm)
OFX3	2000 - 5000 SUS	(1) High Capacity or Standard Capacity	37 gpm (140 lpm)
OFX4	150 - 500 SUS	(2) High Cap. or Stand. Cap. in series	82 gpm (310 lpm)
OFX5	500 - 2000 SUS	(2) High Cap. or Stand. Cap. in series	82 gpm (310 lpm)
OFX6	2000 - 5000 SUS	(2) High Cap. or Stand. Cap. in series	37 gpm (140 lpm)
OFX7	100 - 25,000 SUS	(1) High Capacity	6 gpm (23 lpm)
OFX8	100 - 25,000 SUS	(2) High Capacity in parallel	30 gpm (114 lpm)

Pump, Motor and Weight Data

Skid Series	Flow (gpm)	Motor (hp)	Weight (lb)*	Skid Series	Flow (gpm)	Motor (hp)	Weight (lb)*
OFX1	09 17 37 82	1.5 3 5 10	238 - 357 300 - 504 329 - 577 476 - 705	**OFX5**	09 17 37 82	2 5 10 15	301 - 442 396 - 684 497 - 849 947 - 1054
OFX2	09 17 37 82	1.5 3 5 10	238 - 357 311 - 504 348 - 577 597 - 705	**OFX6**	09 17 37	2 5 10	267 - 650 370 - 659 502 - 607
OFX3	09 17 37	1.5 5 10	238 - 479 340 - 580 461 - 566	**OFX7**	06	2	–
OFX4	09 17 37 82	2 3 5 10	372 - 442 353 - 662 398 - 791 551 - 904	**OFX8**	30	15	–

* Weight dependent on options chosen.

Porting Data

Flow (gpm)	Inlet Port Sizes	Outlet Port Sizes with Standard Capacity Filters	Outlet Port Sizes with High Capacity Filters
06	1” JIC	N/A	1.625-12UN-2B SAE O-Ring Boss
09	1.625-12UN-2B SAE O-Ring Boss	1.312-12UN-2B SAE O-Ring Boss	1.625-12UN-2B SAE O-Ring Boss
17	1.875-12UN-2B SAE O-Ring Boss	1.625-12UN-2B SAE O-Ring Boss	1.625-12UN-2B SAE O-Ring Boss
30	2” JIC	N/A	1.625-12UN-2B SAE O-Ring Boss
37	2” JIC	1.875-12UN-2B SAE O-Ring Boss	1.875-12UN-2B SAE O-Ring Boss
82	2” JIC	1.875-12UN-2B SAE O-Ring Boss	2.500-12UN-2B SAE O-Ring Boss

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Model Code

OFX4 - 09 - H1 - BN - 3 - BN - 3 - B - N - N - B - G - N - C

Series
OFX = Filter Skid

Size
1, 2, 3, 4, 5, 6, 7, 8

Flow Rate
06 = 6 gpm (22.7 lpm) *(size 7 only)*
09 = 9 gpm (34 lpm) *(size 1-6 only)*
17 = 17 gpm (64.3 lpm) *(size 1-6 only)*
30 = 30 gpm (113.6 lpm) *(size 8 only)*
37 = 37 gpm (140 lpm) *(size 1-6 only)*
82 = 82 gpm (310.4 lpm) *(size 1, 2, 4, 5 only)*

Filter Designation
Standard Capacity (S)
S1 = 9 gpm *(sizes 1 - 6)*, 17, 37 gpm *(sizes 1 & 4)*
S2 = 9, 17 gpm *(sizes 1 - 6)*, 37 gpm *(sizes 1 & 4)*
S3 = 9, 17, 37 gpm *(sizes 1 - 6)*, 82 gpm *(sizes 1 & 4)*
High Capacity (H)
H1 = 9 gpm *(sizes 3 & 6)*, 17 gpm *(sizes 1 - 6)*, 37, 82 gpm *(sizes 1 & 4)*
H3 = 6 gpm *(size 7)*, 9, 17 gpm *(sizes 3 & 6)*, 30 gpm *(size 8)*, 37 gpm *(sizes 1 - 6)*, 82 gpm *(sizes 1, 2, 4, & 5)*

Filter Media *(first stage all sizes)*
BN = Betamicron®
AM = Aquamicron® water removal

Filtration Rating *(micron) (first stage all sizes)*
3, 5, 10, 20 *(sizes 1, 2, 4, 5)*
5, 10, 20 *(sizes 3 & 6)*
10, 20 *(sizes 7 & 8)*
= BN
10 = AM

Filter Media *(second stage sizes 4, 5, 6, & 8)*
BN = Betamicron®
AM = Aquamicron® water removal

Filtration Rating *(micron) (second stage sizes 4, 5, 6, & 8)*
3, 5, 10, 20 *(sizes 4 & 5)*
5, 10, 20 *(size 6)*
10, 20 *(size 8)*
= BN
10 = AM

Seals
B = Buna *(standard)*
H = EPR
V = Fluroelastomer (FPM)

Voltage
A = 115 VAC 1.5 hp *(sizes 1-3 with 9 gpm only - includes switch, 10' cord & plug)*
N = 230 /460 VAC 3 ph *(sizes 1-8)*
E = 575 VAC 3 ph *(Built to CSA standards)*

Motor
N = TEFC
W = Washdown (NEMA Design B)

Starter Control Options*
N = None
A = 230 VAC
B = 460 VAC
C = 230 VAC (with VFD)
D = 460 VAC (with VFD)
E = 575 VAC
F = 575 VAC (with VFD)

Clogging Indicator
N = Visual pop-up in cap *(standard)*
G = Differential pressure gauge
M = Electric with 12 ft. 4 in. conductor wire
C = Differential pressure gauge with electric switch*

Vacuum Gauge
N = None
V = Vacuum gauge

Options
N = None
S = Suction strainer *(standard on sizes 7 & 8)*
C = 4 wheeled cart *(sizes 1-6 only)*
B = Continuous bleed *(for continuously aerated systems - includes cap vent port, valve and return line)*
P = Particle counter *(sizes 1& 4 only)*

*Motor starter control option - C-series, non-disconnect shut-off, "motor on" light, electrical indicator "change element" light, and type 4x wash down enclosure.
VFD control option - same as above but with enclosed variable frequency drive control and larger metal NEMA enclosure.
For replacement element part numbers, please see page 69 of this catalog.

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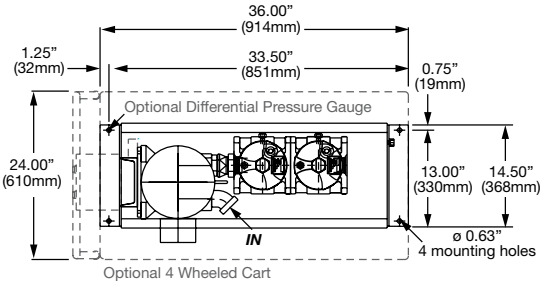
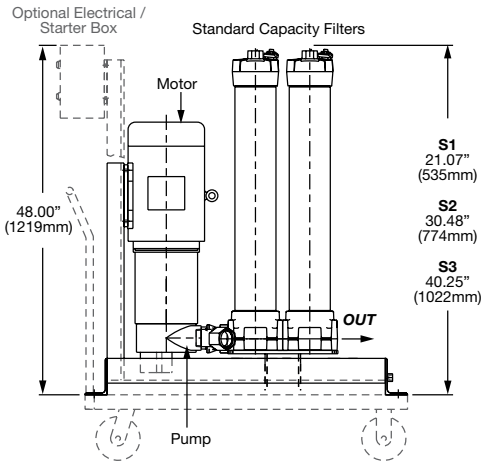
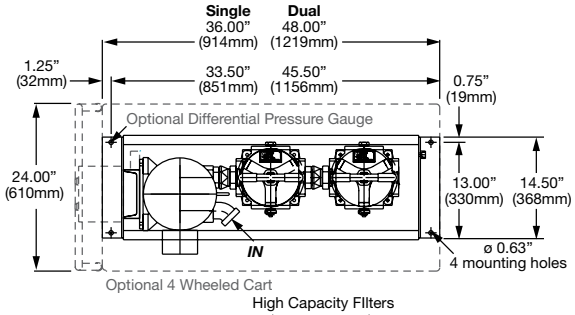
Dimensions

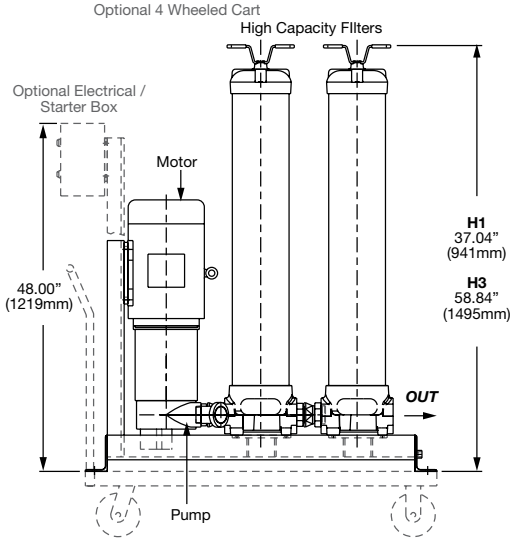
OFX4, OFX5 & OFX6 Series (Dual Standard Capacity Filter Version)



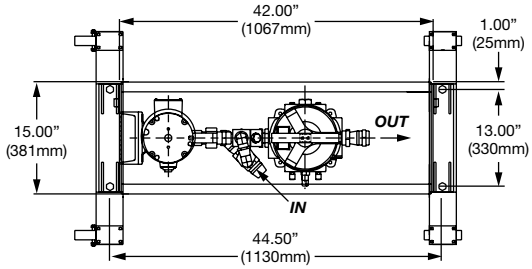


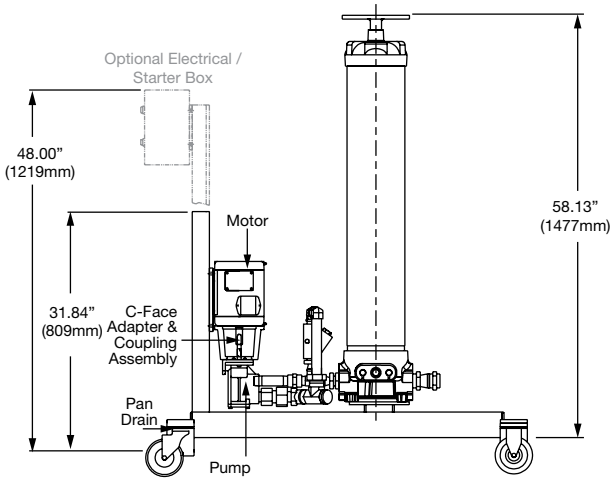
OFX4, OFX5 & OFX6 Series (Dual High Capacity Filter Version)



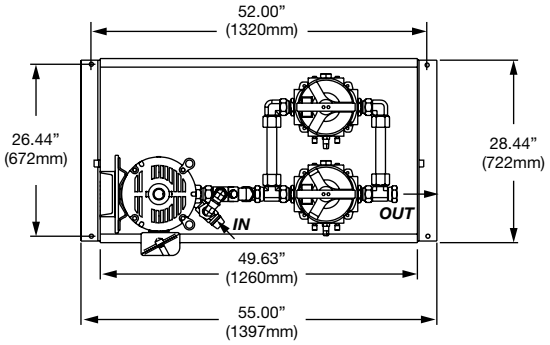


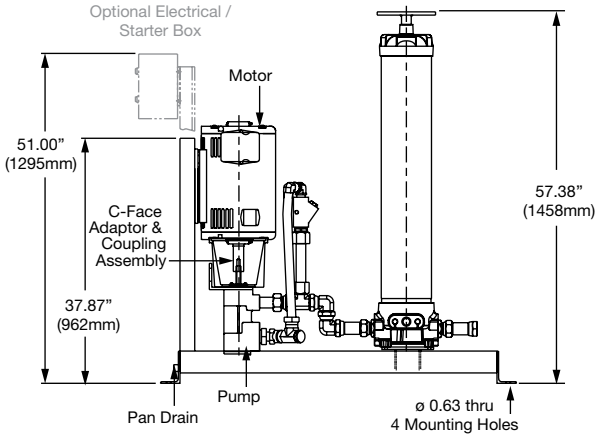
OFX7 Series - High Viscosity





OFX8 Series - High Viscosity





Dimensions are for general information only, all critical dimensions should be verified by requesting a certified print.

OF7 Series
Hand Held Portable Filter

Design
A low noise vane pump is directly flanged to the electrical motor and fixed to an aluminum housing with a foot bracket. The suction line has a cleanable wire screen strainer for pump protection. An AC motor is standard, DC optional.

Features
The OF7 is ideal for maintaining construction and agricultural machinery, off-highway vehicles and trucks. It is equally useful for servicing a wide variety of industrial equipment.

The standard OF7 incorporates a highly efficient Betamicron® spin-on filter element with a 10 µm absolute rating. Elements with other ratings are available. Other features of the unit include:

- Relief valve in housing.
- Static pressure gauge clogging indicator.
- Element easily replaced with strap wrench.

The OF7S90 high viscosity unit features a motor with higher power, a size 180 spin-on element as well as a special frame adapted to the larger component sizes.

Applications
The portable OF7 filtration unit is a compact filter/pump device used for transferring and filtering hydraulic fluids. It can be used for:

- Removing water from oil
- Changing oil in hydraulic systems.
- Filling hydraulic systems with filtered oil.
- Off-line filtration of hydraulic systems with inadequate filtering capacity.
- Flushing of small hydraulic systems

Multi-Pass Filtration Efficiency Ratings for Betamicron® Elements (to ISO 4572)
- Beta Ratios for differential pressures above the indicator trip pressure are shown to demonstrate particle removal at high differential pressures.
- Beta Ratios for many competitive elements drastically deteriorate at high differential pressure.

Betamicron® BN Beta Ratio Data

Betamicron Media	Absolute Rating	Terminal ΔP Across Filter Element
03 BN	ß3 ≥ 200	43 psi
05 BN	ß5 ≥ 200	43 psi
10 BN	ß10 ≥ 200	43 psi
20 BN	ß20 ≥ 200	43 psi

Technical Details

Recommended Fluid	Petroleum based oils. *(Contact HYDAC for other applications.)*
Nominal Flow OF7S10 OF7S90 OF7CM	 4gpm / 15 l/min 4gpm / 15 l/min 2.5 gpm / 10 l/min
Maximum Oil Temperature	180°F / 80°C
Viscosity Range OF7S10 OF7S90 OF7CM	 20-1600 SUS / 5-350 cSt 70-4600 SUS / 15-1000cSt 20-900 SUS / 5-200cSt
Max. Operating Pressure	50 psi / 3.5 bar
Weight	27.5 lb / 12.5 kg
Electrical Motor	110 VAC (0.25 HP / 0.18 KW) or 24 VDC (0.27HP / 0.20KW)

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Model Code

OF7 S 10 P 1 K 1 B 10 E -

Series
OF7 = Hand Held Portable Filter

Type
S = standard CM = Standard with fluid condition monitoring

Code
10 = standard
90 = High Viscosity Option *(only for OF7S type)*

Seals
P = Nitrile (NBR) *(standard)*

Pump
1 = Vane Pump *(standard)*
2 = Pump for OF7S90 and OF7CM options

Electric Motor Voltage
K = 110 VAC, 60 Hz *(standard)*
AE60 = 120V/60Hz/single phase *(OF7S90 option only)*
U = 24 VDC
D = pneumatic motor

Spin-on Filter Element Size
1 = Size 0160
2 = Size 0180 *(OF7S90 option only)*

Filter Element Material
B = Betamicron® Low Collapse P = Paper A = Water Removal

Filtration Rating *(microns)*
03, 05, 10, 20 — BN Absolute Filtration
10 — P -Nominal Filtration
10 — W Water Removal

Type of Clogging Indicator
E = Pressure Gauge

Options
C1 = with Contamination Sensor

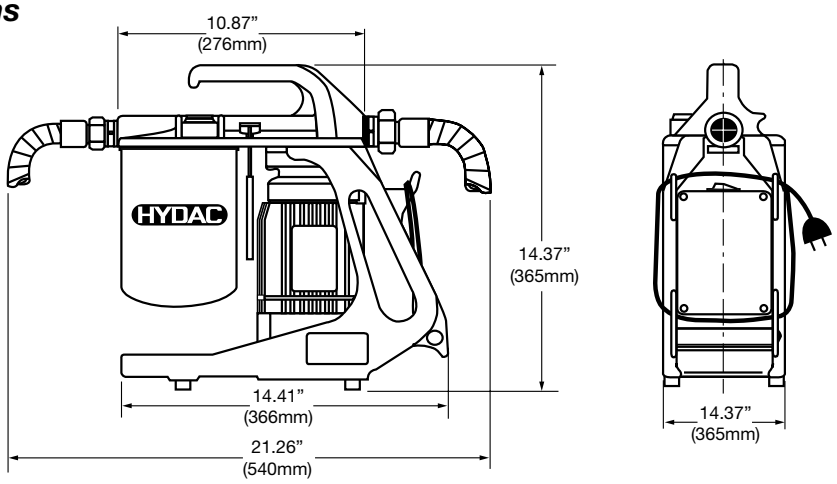
For replacement element part numbers, please see page 69 of this catalog.

Model Codes Containing RED are non-standard items – Minimum quantities and longer lead times may apply - Contact HYDAC for information and availablity.

Replacement Element Model Codes

Micron Rating	160: Betamicron® (Part No.)	180: Betamicron® (Part No.)	Paper (Part No.)	Water Removal (Part No.)
3 µm	0160MA003BN (02059434)	0180MA003BN (02059438)	–	–
5 µm	0160MA005BN (02059435)	0180MA005BN (02059439)	–	–
10 µm	0160MA010BN (02059436)	0180MA010BN (02059440)	0160MA010P (02058116)	0160MA010A (02058771)
20 µm	0160MA020BN (02059437)	0180MA020BN (02059441)	–	–

Dimensions



Dimensions are for general information only, all critical dimensions should be verified by requesting a certified print.

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OLF Compact Series

Benefits

- Lower operating costs
- Extended element service life
- Extended fluid life
- Cleaner, more efficient systems
- Incinerable elements
- Easy installation

Applications

Typical applications include:

- Injection molding machinery
- Machine tools
- Gear boxes
- Mobile equipment
- Filtration of fluids for intermittently operated hydraulic systems and test stands

Features

The OLF Compact filter is designed to be used offline to efficiently and cost effectively filter standard hydraulic oils which are highly contaminated. The OLF Compact is specifically designed to be used on hydraulic systems with a reservoir volume of up to 1000 gallons. Please see sizing calculation on back page. The standard filters can be supplied as ready to install offline units complete with motor and pump units as shown or as individual filters.

Technical Details

Operating Range	
Viscosity: *(see pressure drop curves)*	to 700 SUS (OLF-5) / to 3000 SUS (OLF-5/15) / to 10,000 SUS (OLF-5/4)
Operating Pressure:	45 psi (3 bar) max
Suction Pressure:	11” Hg (-0.4 to 6 bar) max
Inlet Pressure *(Model with flow control valve)*:	145 psi (10 bar) min / 725 psi (50 bar) max
Fluid Temperature:	32° to 175°F (0 to 80°C)
Ambient Temperature:	-4° to 104°F (-20 to 40°C)
Seals:	NBR *(standard)*
Maximum Flow Rate:	OLF-5 = 1.6 gpm / OLF-5/15 = 4.9 gpm / OLF-5/4 = 1.3 gpm
Fluids	Standard Mineral Oils / Water/Oil based fluids *(Minimum 40% Oil in Fluid)* Consult factory for other fluids.
Elements	
Media:	Dimicron - 2µm, 20µm / Water Removal - 2µm, 20µm
Number required:	OLF-5, 5/15, and 5/4 = 1
Dirt Holding Capacity (ΔP = 36 psi [2.5 bar])	200g ISO MTD *(N5DM...)* / 185g ISO MTD *(N5AM...)*
Water Retention (ΔP = 36 psi [2.5 bar]):	Approximately 0.5 quarts (0.5 liters)
Beta Ratio:	ßx > 1000 *(absolute value)*
Maximum ΔP:	45 psi (3 bar)
Connections *(All Female)*	
OLF-5 with motor/pump:	Inlet & Outlet: 3/4 - 16UNF (SAE 8) (BSPP G1/2)
OLF-5/15 & 5/4:	Inlet & Outlet: 1 5/16-12UN (SAE 16) (BSPP G1)
OLF-5 without motor/pump:	Inlet: 9/16-18UNF (SAE 6) (BSPP G3/8) Outlet: 3/4-16UNF (SAE 8) (BSPP G1/2)
Weight	OLF-5-S (15.5 lbs. (7.0 kg) / OLF-5-E (5.5 lbs. (2.5 kg) / OLF-5/15 (24.3 lbs. (11 kg) OLF-5/4 (24.3 lbs. (11 kg)

Housing drain standard on all units
Black = SAE connections when using adapters which are supplied as standard
Red = BSPP connections if supplied adapters are not used

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Model Code

OLF-5 - S - 120 - K - N5DM002 - E / 12 / C1

Series
- OLF-5 = Series 5 (1.6 gpm)
- OLF-5/15 = Series 15 (4.9 gpm)
- OLF-5/4 = Series 15 (1.3 gpm)
- OLFCM-5/15 = With Fluid Condition Monitoring

Pump Type
- S = Vane Pump* *(standard)*
- E = Flow Control Valve *(series 5 only)*
- TV = Toploader with Motor *(use with OLFCM only)*

Power Consumption
- 120 = 120W for all OLF 5
- 200 = 200W for all 24VDC
- 370 = 370W for all Series 5/15 & 5/4
- Z = Without motor-pump unit *(series 5 only)*

Voltage
- K = 115V single phase *(series 5/15 and 5/4 only)*
- L60 = 115V single phase *(series 5 only)*
- M = 220V single phase
- N = 220/440V 3 phase
- U = 24VDC
- Z = Without motor-pump unit

Element
- N5DM002 = 2 micron
- N5DM005 = 5 micron
- N5DM010 = 10 micron
- N5DM020 = 20 micron
- N5AM002 = 2 micron with water removal
- N5AM020 = 20 micron with water removal
- M180B20 = 20 micron spin-on *(series 5/4 only)*

Clogging Indicator
- E = Standard gauge *(series 5 & 5/4 only)*
- F = Static electrical switch — VMF2F.0 *(series 5 & 5/4 only)*
- BM = Differential visual — VM2BM.1 *(series 5/15 & 5/4 only)*
- C = Differential electrical — VM2C.0 *(series 5/15 & 5/4 only)*
- D = Differential electrical/visual — VM2D.0/L... *(series 5/15 & 5/4 only)*

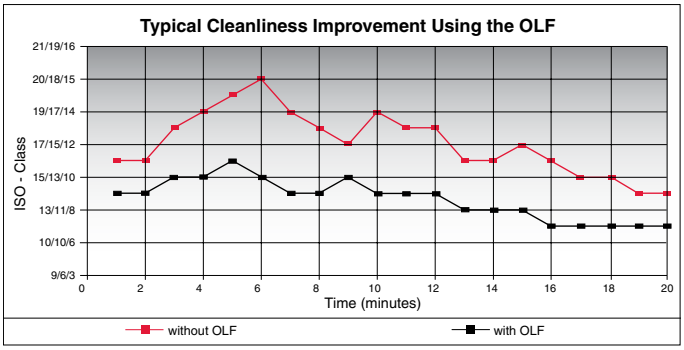
Mechanical Connections
- 12 = SAE Connections *(standard)*

Supplementary Details
- L24, L48, L115, L230 = Lamp for D-type clogging indicator *(LXX, XX = voltage)*
- A = With AquaSensor AS1000 Series *(OLFCM only)*
- C1 = With Contamination Sensor CS1320 *(OLFCM only)*
- C2 = With Contamination Sensor CS1310 *(OLFCM only)*

Consult Factory for special options.
Not all combinations available.
*Choose “S” for model without motor-pump and without flow control valve.

For replacement element part numbers, please see page 69 of this catalog.

Model Codes Containing RED are non-standard items – Minimum quantities and longer lead times may apply - Contact HYDAC for information and availablity.



Replacement Element Model Codes	
Betamicron®	
2 µm	N5DM002
20 µm	N5DM020 or 180MA020BN (OLF-5/4 only)
Water Removal	
2 µm	N5AM002
20 µm	N5AM020

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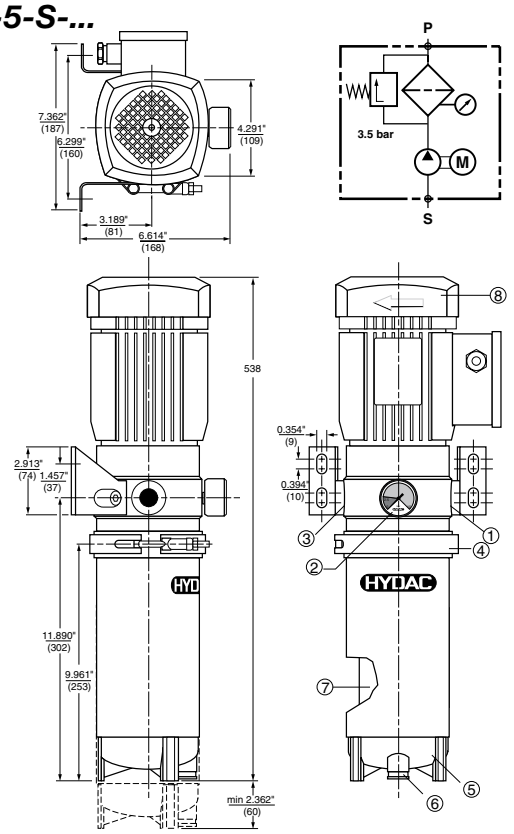
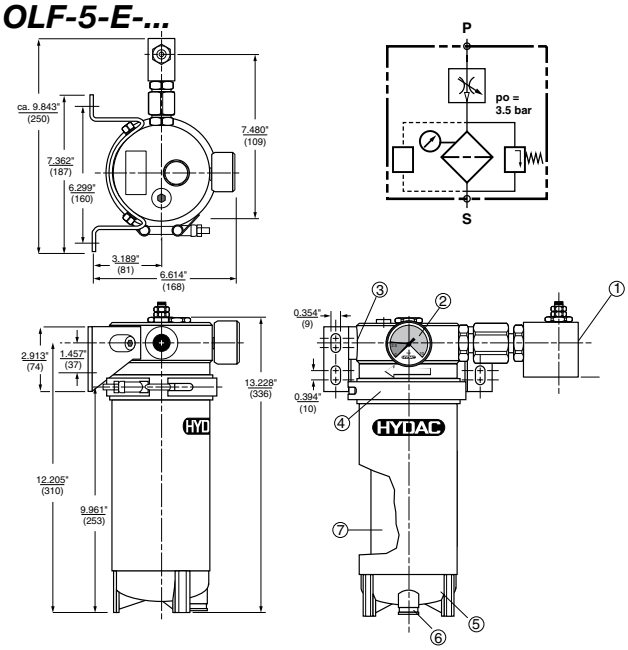
Dimensions

OLF-5-S-...



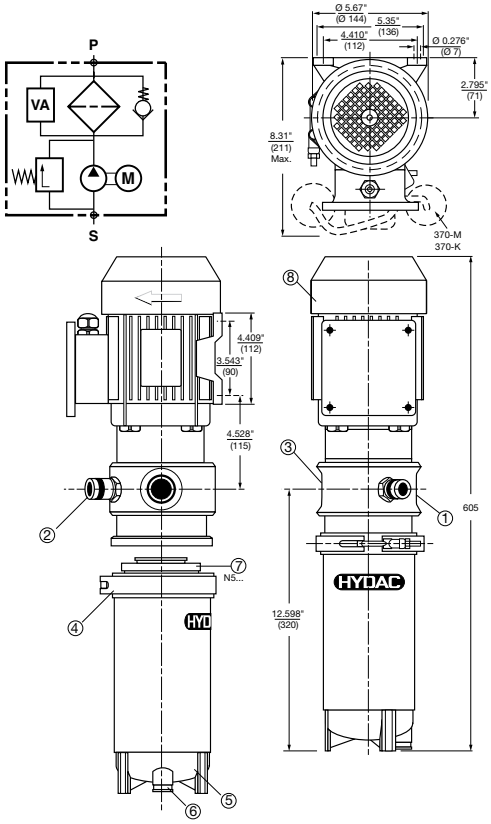
OLF-5-E-...



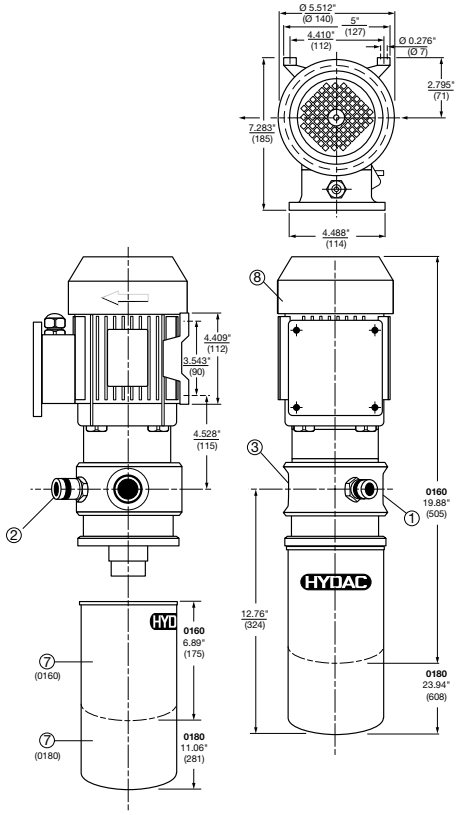
Key

1	=	Inlet	5	=	Filter Bowl
2	=	Clogging Indicator	6	=	Drain
3	=	Outlet	7	=	Filter Element
4	=	Clamp	8	=	Electric Motor

OLF-5/4-S-... and OLF-5/15-S...



OLF-5/4-SP-...



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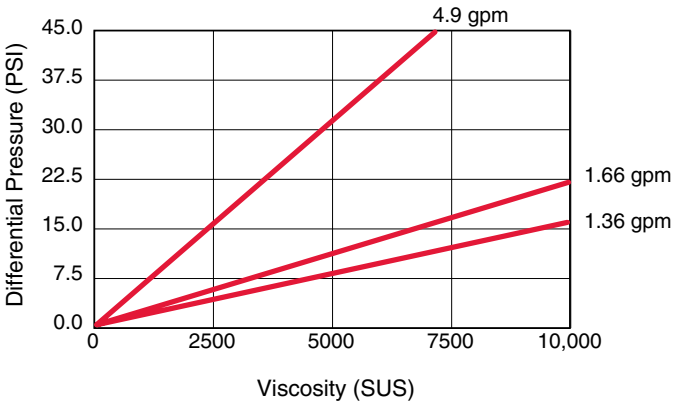
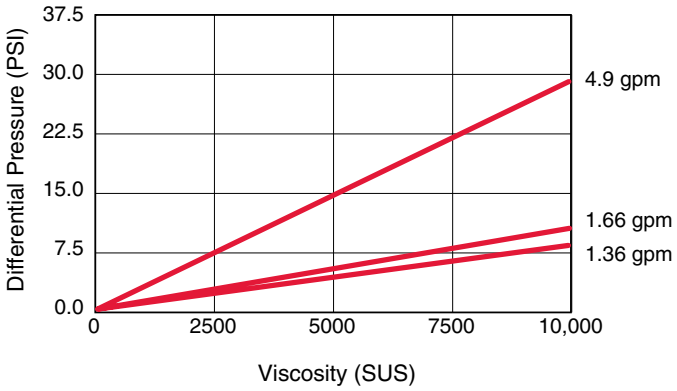
Differential Pressure

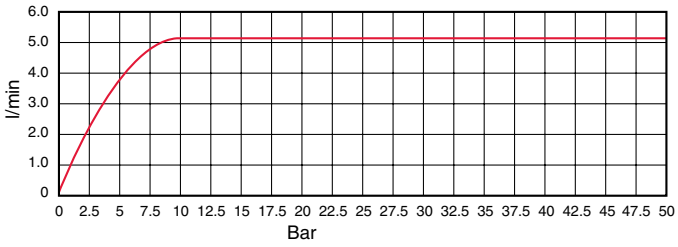
N5DM002



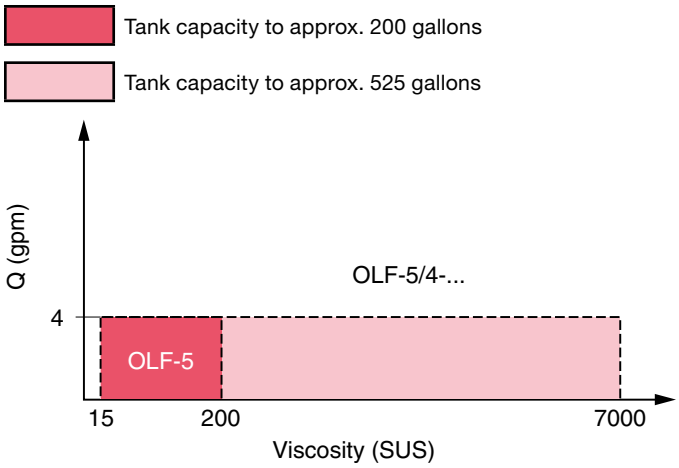
N5DM020



SRV Flow Control Valve Curve



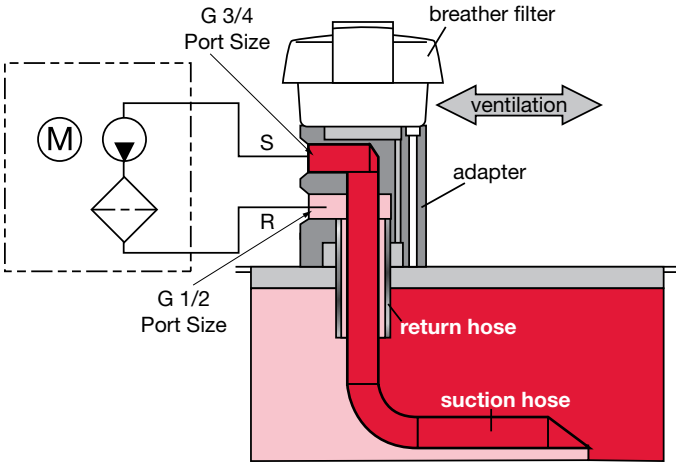
Application



OLF-5-TAK

Description

Use the OLF-5-TAK tank connection kit 2.0 to quickly mount bypass filter units on hydraulic installations. This component can be mounted on installations with ventilation filter whose connections conform to DIN 24557/T2.



Ordering Information

Model Code: OLF-5-TAK

Part No.: 03039235

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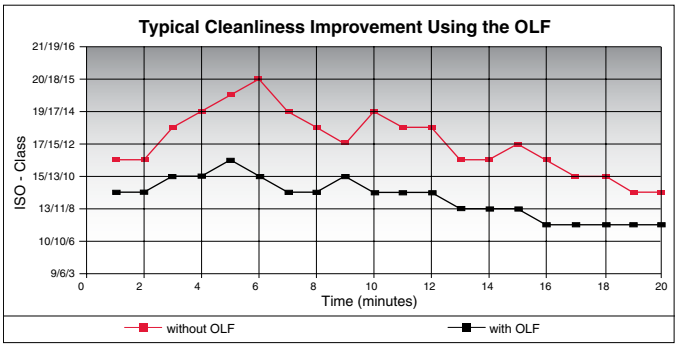
OLF Series



Features and Benefits

The OLF series of filters is designed to efficiently and cost effectively filter hydraulic oils, lubricating oils, cleaning fluids and coolants which are highly contaminated. The filters can be supplied either as individual filters or as ready-to-install offline units complete with optional motor and pump units.

- Lower Operating Costs
- Extended Element Service Life
- Cleaner, more efficient systems

Dimicron® Technology

Dimicron® technology, which incorporates membrane filtration and multi-disc construction, sets the OLF apart from conventional filters by providing it with exceptional dirt holding capacity and separation efficiency. Each filter element is able to capture and hold more than 1 pound of dirt, meaning that the OLF60, which uses four elements, will hold nearly 5 pounds of dirt. Membrane filtration provides the OLF with a separation efficiency over 99.9% for particles 2 micron and larger (ß2 > 1000) even in a single pass.

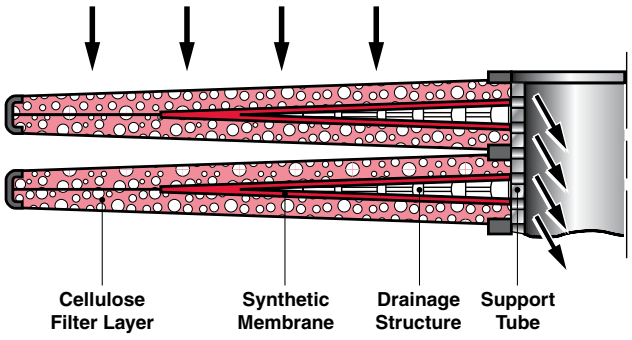
Applications

Typical applications include:

- Filling and flushing hydraulic units
- Filtration of fluids for hydraulic systems and test stands
- Filtration of cleaning fluids for parts washing machines
- Filtration of coolants

Dimicron® Element

The synthetic membrane *(2µm absolute)* provides a high filtration rating while the cellulose filter layer collects and holds the bulk of the dirt load. This combination results in excellent removal efficiency, even in a single pass, and extremely high dirt holding capacity.



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Model Code

OLF - 15 / 15 - S - L60 - N15DM002 - E / 12

Series
- OLF = Stationary offline filter with integrated pressure gauge

Size
- 15 = 1 element
- 30 = 2 elements
- 45 = 3 elements
- 60 = 4 elements

Pump Flow Rate *(must be less than or equal to size)*
- 15 = 5 gpm
- 30 = 10 gpm
- 45 = 15 gpm
- 60 = 20 gpm
- Z = without pump

This code entry (15,30, 45, 60) must be less than or equal to the size entry (15,30, 45, 60)

Pump Type
- S = vane pump
- G = gear pump
- W = centrifugal pump
- Z = Without motor-pump

Motor Voltage
- L60 = 115V, Single Phase
- O60 = 460V, Three Phase
- Z = Without motor-pump

Filter Element
- N15DM002 = Dimicron® 2 µm Absolute
- N15DM010 = Dimicron® 10µm Absolute
- N15DM020 = Dimicron® 20 µm Absolute
- N15DM030 = Dimicron® 30 µm Absolute

Clogging Indicator

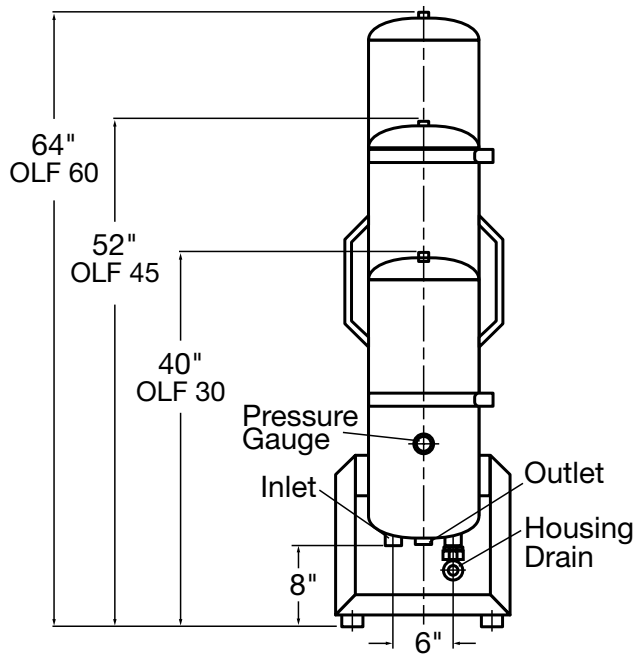
E	= Standard gauge	
BM	= Differential visual	VM2BM.1
C	= Differential electrical	VM2C.0

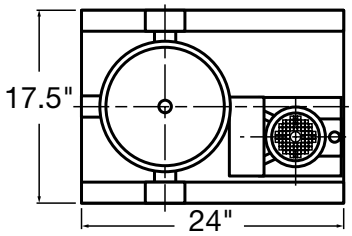
Supplementary Details
- 12 = SAE adapters *(BSPP connections are standard)*
- V = Viton® Seals *(NBR seals are standard)*
- MP = Integrated TestPoint for connection to FCU via Minimess Line

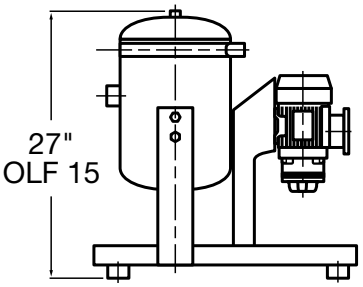
For replacement element part numbers, please see page 69 of this catalog.

Model Codes Containing RED are non-standard items – Minimum quantities and longer lead times may apply - Contact HYDAC for information and availablity.

Dimensions







Dimensions are for general information only, all critical dimensions should be verified by requesting a certified print.

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Technical Details

Connections (All Female)									
Housing Inlet & Outlet: 1 5/16 - 12UN (SAE 16) I G1*									
Pump Inlet:									
Model	**Vane**			**Gear**			**Centrifugal**		
OLF-15	1 1/16 -12UN	(SAE 12)	G3/4	1 1/16 -12UN	(SAE 12)	G3/4	1 5/16-12UN	(SAE 16)	G1
OLF-30	1 5/8 -12UN	(SAE 20)	G1 1/4	1 5/16 -12UN	(SAE 16)	G1	1 5/16-12UN	(SAE 16)	G1
OLF-45, 60	1 5/8 -12UN	(SAE 20)	G1 1/4	1 7/8 -12UN	(SAE 24)	G1 1/2	1 5/8 -12UN	(SAE 20)	G1 1/4

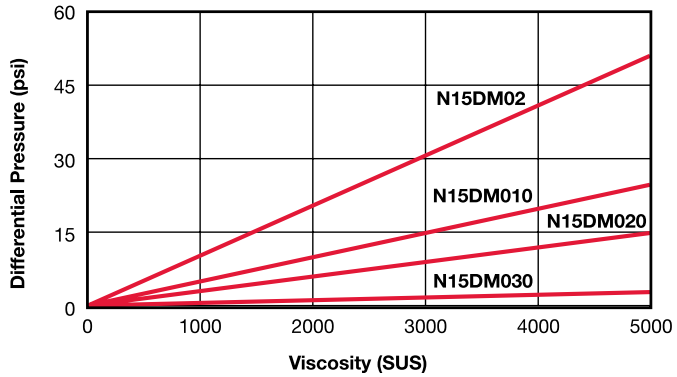
Housing drain standard on all units
BLACK = SAE connections when using adapters which are supplied standard
RED = BSPP connections if supplied adapters are not used

	OLF-15	OLF-30	OLF-45	OLF-60
Filter Element	N15DMxxx(1x)	N15DMxxx(2x)	N15DMxxx(3x)	N15DMxxx(4x)
Contamination Retention Capacity	500g (1.1lbs)	1000g (2.2lbs)	1500g (3.3lbs)	2000g (4.4lbs)
Filter Efficiency	ßx > 1000	ßx > 1000	ßx > 1000	ßx > 1000
Permissible Δp Across the Element (psi)	72.5	72.5	72.5	72.5
Weight Element (lbs)	6.6	13.2	19.8	26.4
Material of Filter Housing	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel
Capacity of Pressure Vessel (gallons)	5.25	10.50	15.75	20.5
Max. Operating Pressure Filter Housing (psi)	85	85	85	85
Material of Seals-Housing (standard)	NBR	NBR	NBR	NBR
Weight Housing (lbs)	25	33	53	62
Fluid Temperature in °F	15-175	15-175	15-175	15-175

Motor-Pump Units	5 gpm	10 gpm	15 gpm	20 gpm
Operating Pressure of the Pump (psi)	65	65	65	65
Viscosity Range with Vane Pump (SUS)	75-2500	75-2500	75-2500	75-2500
Viscosity Range with Gear Pump (SUS)	75-5000	75-5000	75-5000	75-5000
Viscosity Range with Centrifugal Pump (SUS)	5-100	5-100	5-100	5-100
Motor Capacity (watts)				
Vane Pump	370 W	570 W	1500 W	1500W
Gear Pump	370 W	570 W	1500 W	1500W
Centrifugal Pump	370 W	570 W	1500 W	1500W
Weight Vane Pump (lbs)	17	30	43	43
Weight Gear Pump (lbs)	21	33	49	49
Weight Centrifugal Pump (lbs)	33	33	55	55
Material of Seals in Pumps (standard)	NBR	NBR	NBR	NBR

All details in this brochure are subject to technical modifications.

Differential Pressure at 3.96 gpm (15 L/min)



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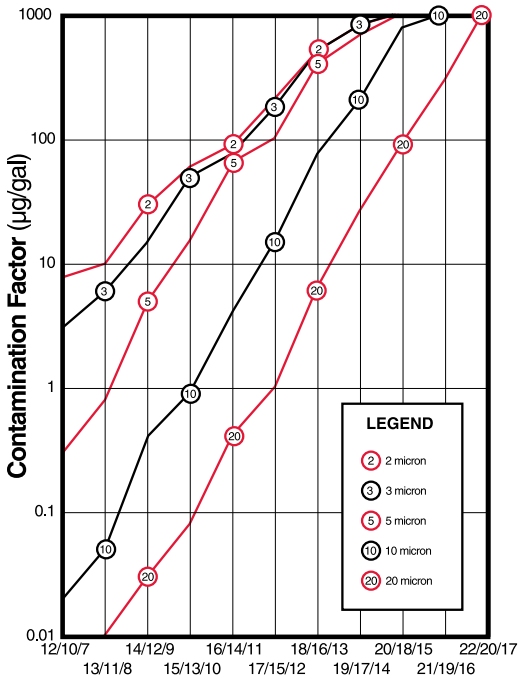
Sizing Offline Filtration

The following calculations will help to approximate the attainable system cleanliness level when applying offline filtration.

Step 1: Select the approximate contamination ingression rate from the chart below. HYDAC quantitative investigations have yielded the following approximate figures.

TYPE OF SYSTEM	CONTAMINATION INGRESSION (µg/gal) SURROUNDINGS		
	CLEAN	NORMAL	POLLUTED
Closed circuit	1	3	5
Injection molding machine	3	6	9
Standard hydraulic system	6	9	12
Lubrication system	8	11	14
Mobile equipment	10	13	16
Heavy industrial press	14	18	22
Flushing test equipment	42	60	78



Step 2: Make the correction required for offline filtration. The contamination input selected above must be multiplied by the factor:

Main System Flow Rate / Desired Offline Flow Rate

Note: Main system flow rate must be corrected for cycle time. For example, if the flow rate is 500 gpm, but only runs for 20% of the system cycle, the main system flow rate would be 100 gpm. (500 gpm X 20%)

This yields the expression:

$$\textbf{Contamination Factor} = \textbf{Contamination Input}\ (\mu g/gal) \times \frac{\textbf{Main System Flow Rate}\ (gpm)}{\textbf{Desired Offline Flow Rate}\ (gpm)}$$

Calculate the contamination factor using this expression.

Step 3: Determine the attainable cleanliness level. Locate the calculated contamination factor on the y-axis of the attached graph. Go to the right to find the intersection point on the curve corresponding to the desired absolute filter micron rating. Read the resulting attainable cleanliness level on the x-axis. *(In case of dynamic flow through the offline filter, the attainable cleanliness level will be 2 to 3 times worse than indicated by the graph.)*

Offline Filtration Sizing Example

Type of System: Heavy industrial press

Surroundings: Normal

Main System Flow Rate: 150 gpm

Desired Offline Flow Rate: 16 gpm (OLF 60)

Step 1: Using this criterion select the approximate contamination ingression rate from the chart above.

This yields a contamination input of **18** µg/gal based on a ***heavy industrial press*** with ***normal*** surroundings.

Step 2: Make the correction required for offline filtration.

Contamination Factor = **18** µg/gal x **150** gpm / **20** gpm = **135**

Step 3: Determine the approximate attainable cleanliness level for each micron rating using the attached graph. If the attainable cleanliness level is not acceptable, the desired offline flow rate should be increased. The approximate attainable levels for this example are as follows.

2µm - ISO 17/15/12

20µm - Between ISO 20/18/15 and ISO 21/19/16

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OLFP Series

Description

The OffLine Filter Pressure OLFP is a stationary offline filter and is used for the purpose of separating out oil ageing byproducts, water and solid particles from hydraulic and lubrication fluids. It can be used with or without motor pump unit. The housing is pressure-stable up to 290 psi (20 bar).

Thanks to its compact construction, the OLFP is also ideally suitable for utilization in even the smallest of installation spaces.

The Trimicron filter elements (N1TM003) typically used exhibit the following properties:

- Optimum adsorption of oil ageing byproducts to the filter material without rapid clogging
- Filtration rating: 3um
- Very high dirt holding capacity through pronounced depth structure

Features

- Compact design, therefore little space required
- Version with pump or orifice to control the lube flow rate
- Flow rate: 2 – 6 l/min
- No influence on the main lubrication circuit
- High pressure stability of filter housing
- Easy-to-service by upwards filter element exchange
- Possibility to combine fine filtration and fluid condition monitoring in one system
- Filter element technology: Trimicron

Applications

- Gear Oil Filtration
- Wind turbine gearboxes

Technical Details

Filter Element	One N1TMXXX
Operating Pressure	Max. 362.6 psi (25 bar)
Pressure at Inlet (IN)	0 to 7.25 psi (0 to 0.5 bar)
Pressure at Outlet (OUT)	0 psi (0 bar)
Maximum Flow Rate	0.53 gal/min (2 l/min)
Permissible Oper. Viscosity	100 to 500 cSt (450 - 2300SUS)
Inlet (IN)	ISO 228-1 – G 1/2
Outlet (OUT)	SAE (type 108) DN50 (2”)
Ambient Temp. Range	-4° F to 176° F (-20° C to 80° C)
Seals	FPM/NBR
Head Material	Aluminum
Bowl Material	Aluminum
Fluid Temperature Range	-4° F to 176° F (-20° C to 80° C)
Survival Temperature	-40° F (-40° C)
Storage Temperature	-40° F to 86° F (-40° C to 30° C)
Filter Housing Content	2.38 gal. (9 liters)
Weight	46.3 lbs (21 kg)

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Model Code

OLFP - 1 / 2 - G / 1 - Z - Z - N

Series
OLFP = Offline Filter - Pressure

Size
1 = One filter element N1TMXXX

Nominal Flow Rate
2 = 2 gpm

Conditioning Unit
G = gear pump
O = with orifice
Z = without

Element Quantity
1 = 1 filter element

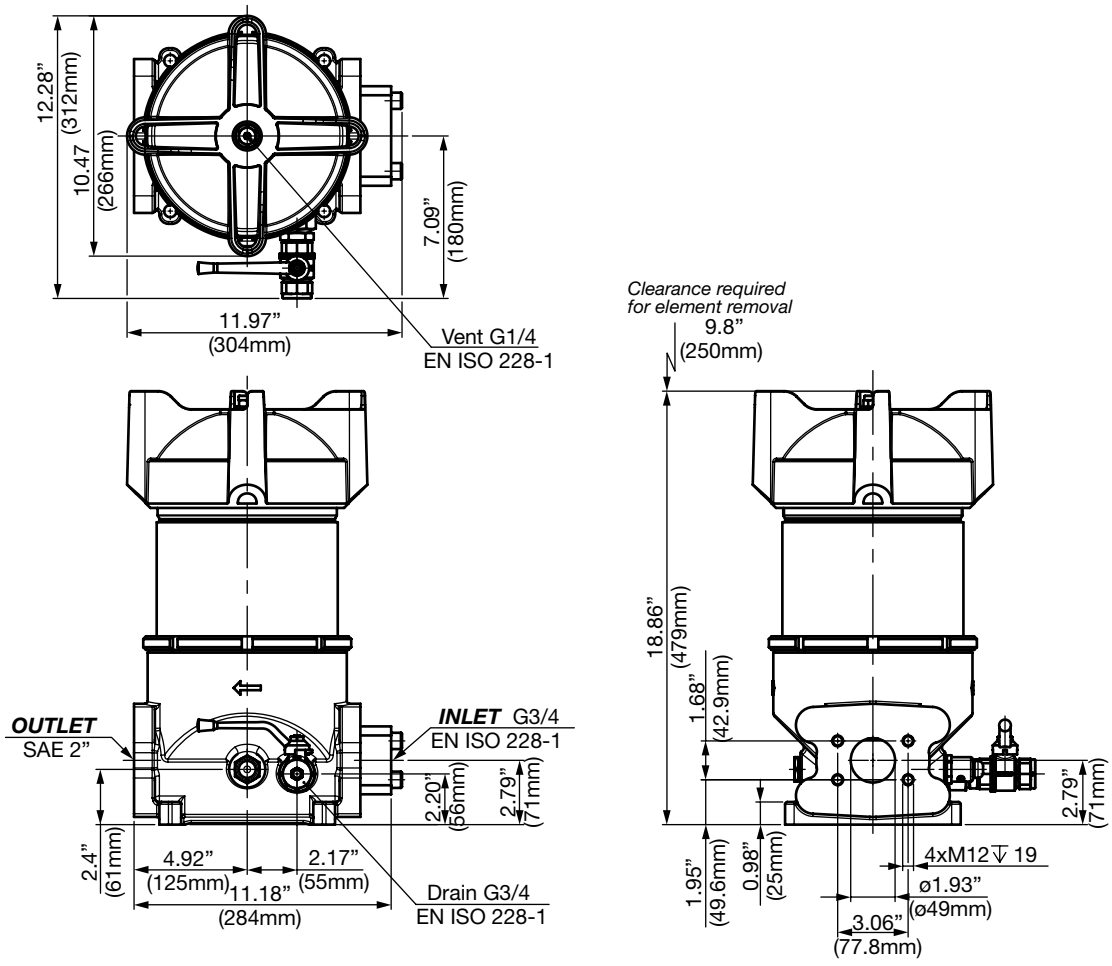
Electric Motor
M = 230 V / 50 HZ / 1 Ph / 0.37 kW
N = 400 V / 50 HZ / 3 Ph / 0.37 kW
AB = 690 V / 50 HZ / 1 Ph / 0.37 kW
X = Other voltages
N60, M60 = Operation at 60 HZ
Z = Without electric motor

Clogging Indicator

E	= Standard, back-pressure indicator	
B	= Differential pressure indicator, visual	VM2BM.x
C	= Differential pressure indicator, electrical	VM2C.x
D3	= Differential pressure indicator, visual/electrical	VM2D.x

Sealing Material
N = NBR
F = FPM

Dimensions



Dimensions are for general information only, all critical dimensions should be verified by requesting a certified print.

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N1TM TriMicron Element Series

Description

The TriMicron series of filter elements have been specially developed for the combined removal of

- fine particles,
- water and
- oil-ageing/oxidation products

from hydraulic and lubrication oils. They are a combination of pleated and SpunSpray depth filter elements. The filter layers are produced using melt-blown technology (synthetic fibers).

Technical Details

Contamination retention Capacity ISOMTD at ΔP = 2.5 bar	~ 370 g
Water Retention Capacity	~ 300 ml
Filtration Rating	3 µm
Permitted Fluid Temperature Range	14 to 176 °F (-10 to 80 °C)
Storage Temperature Range	41 to 104 °F (5 to 40 °C)

Features

- Excellent filtration performance ($\beta_{5(c)} > 1000$)
- Low initial differential pressure
- High contamination retention capacity
- Fine particle contamination and water as well as products of oxidation & oil ageing removed by depth filter material
- Broad range of fluid compatibility
- Simple element change

Applications

- Offline filtration in lubrication systems (e.g. in wind turbines)
- Offline filtration in hydraulic systems
- Transmission and hydraulic test rigs

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Model Code

N 1 TM 003 /- N

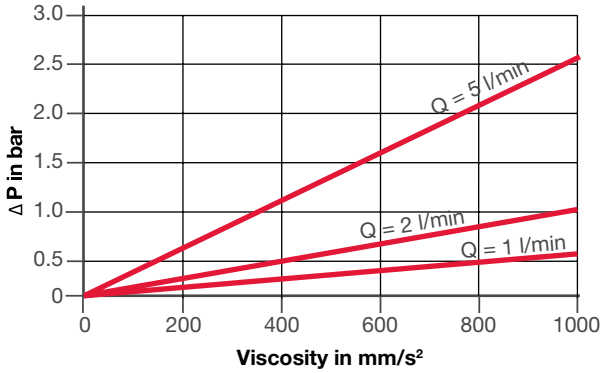
Nominal Flow Rate
1 = Nominal flow rate 1 l/min

Element Type
TM = TriMicron

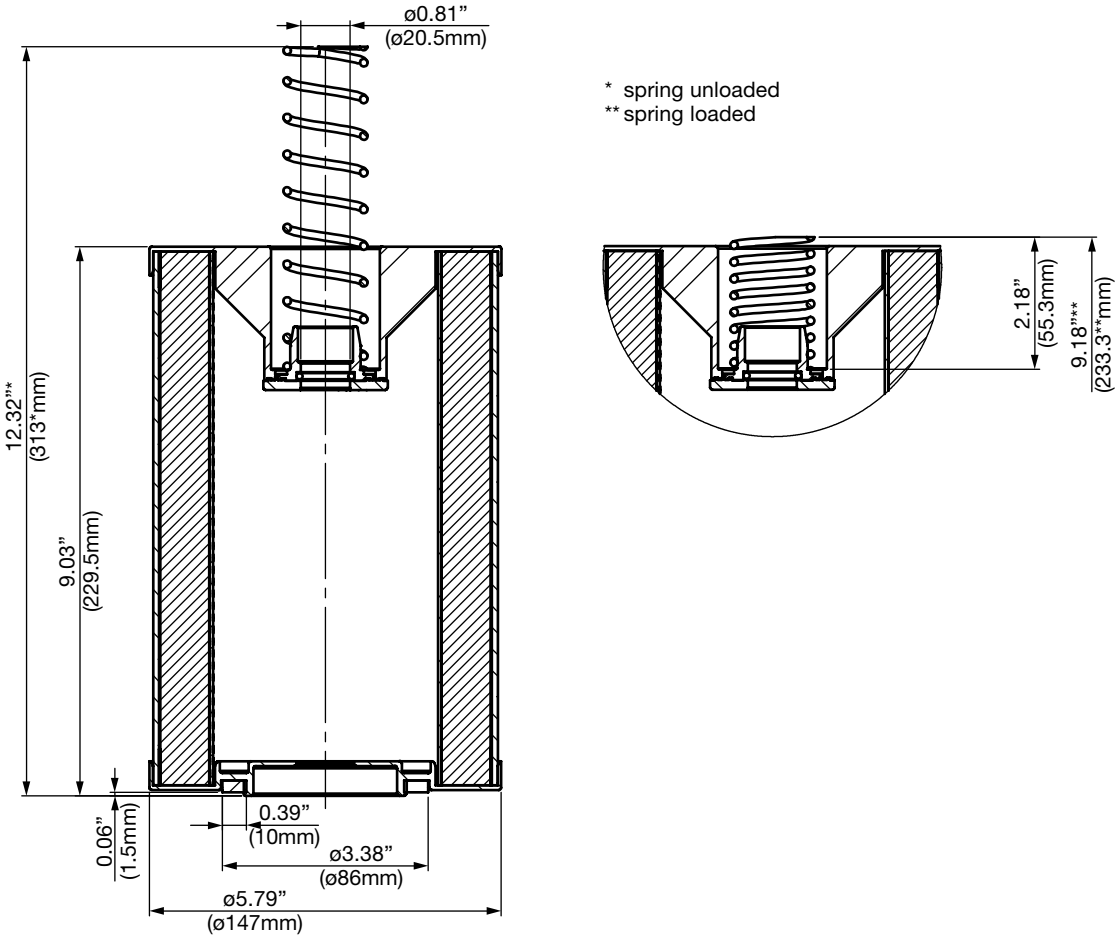
Filtration Rating *(microns)*
003 = 3

Sealing Material
N = NBR
F = FPM

Element Differential Pressure



Dimensions



Dimensions are for general information only, all critical dimensions should be verified by requesting a certified print.

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IXU 1/4 Series
Ion eXchange Unit

IXU1

Description

The easy to service Ion eXchange Units of the IXU series are used for conditioning flame resistant, phosphate-ester-based (HFD-R) hydraulic and lubrication fluids.

They effectively remove acidic products of decomposition and dissolved metals caused by the hydrolysis and/or oxidation of the fluid.

The units are applied to hydraulic and lubrication oil tanks of up to ≈ 20,000 liters with a volumetric flow of ≈ 9 l/min in the bypass flow.

Mobile or stationary IXU are available.

The IXU uses HYDAC Ion eXchange Elements (IXE).

Features

- Effective removal of acids and metallic salts
- No extractable metals or particles, as in the case of fuller's earth or active aluminum oxide
- Easy to service units
- Available as complete unit for service, and as a modular system for retrofitting existing bypass circuits or for OEM.

Advantages

- Extended service life of the operating fluid
- Reduction in functional problems, e.g. with servo valves
- Greater machine and system availability.

We additionally recommend continuous dewatering, for example using a FluidAquaMobil - FAMH.

Applications

- Power plants
- Steel industry
- Other applications with ester-base, flame resistant fluids

Technical Details

Hydraulic Data	
Terminal value neutralization number	< 0.1 mg KOH / g possible
Use typically	Possible up to max. TAN 1mgKOH/gÖl
Flow rate	IXU 1 ≈ 2.2 l/min, IXU 4 ≈ 8.9 l/min
Fluid temperature	86 to 140 °F (30 to 60 °C)
Max. operating pressure	6 bar
Permissible suction pressure at suction inlet IN	-0.4 to 1bar
Viscosity range	15 to 80 cSt
Permissible operating fluid	HFD-R – Flame resistant, phosphate-based hydraulic fluids.
Connectors IN / OUT	½"
Pump type	Gear pump / without
Electrical Data	
Power supply voltage	See ordering details
Power consumption	0.25 to 0.6 kW / 16 Amps
Ambient Conditions	
Operating temperature range	32 to 104 °F (0 to 40 °C)
Storage temperature range	32 to 140 °F (0 to 60 °C)
Relative humidity	0 to 80%, non-condensing
Protection class to DIN 40050	IP 55
General Data	
Length of electrical connection cable *(optional)*	10 m *(for option PKZ, FA1, FA2, see ordering details)*
Length of suction / pressure hose *(optional)*	5 m
Sealing material	Fluoroelastomer FPM
Sound level at 1m	< 80 dB(A)
Weight* *(empty)*	IXU 1 = 155 lbs (70 kg), IXU 4 = 660 lbs (300 kg)
Fluid cleanliness required	ISO 19/17/14 (ISO 4406:1999) 9A/9B/9C (SAE AS4059) *(We recommend to order the unit with prefilter to ensure the required cleanliness level or filter with 5-10µm absolute)*

*Weight noted is for a stationary unit.

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Model Code

IXU - 4 - M - G - F - 05 - BM - 05 /-PKZ

Series
IXU = Ion eXchange Unit

Size
1 = 1 Ion eXchange element IXE200 ≈ 0.5 gpm (2.2 l/min)
4 = 4 Ion eXchange elements IXE200 ≈ 2.5 gpm (8.9 l/min)

Type
M = mobile
S = stationary

Type of pump
G = gear pump
Z = without

Power supply voltage
F = 230 V, 60 Hz, 3 Ph
J = 115 V, 60 Hz, 1 Ph
K = 460 V, 60 Hz, 3 Ph

Prefilter
05 = with 5µm element
10 = with 10µm element
X = without prefilter

Clogging indicator
BM = differential pressure indicator – visual (VM2BM.1)
C = differential pressure indicator – electrical (VM2C.0)

Postfilter
05 = with 5µm element
10 = with 10µm element

Supplementary details
PKZ = with on-off switch and overload protective motor switch
FA1 = with on-off switch, overload protective motor switch and cut-out when filter clogged *(requires neutral wire in power supply)*
FA2 = with on-off switch, overload protective motor switch and cut-out when filter clogged *(does not requires neutral wire in power supply)*

For replacement element part numbers, please see page 69 of this catalog.

Model Codes Containing RED are non-standard items – Minimum quantities and longer lead times may apply - Contact HYDAC for information and availablity.

Sizing

Tank Volume	Ion eXchange Unit
< 924.6 gal. (< 3,500 liters)	IXU-1
924.6 – 3,962.6 gal. (3,500 – 15,000 liters)	IXU-4
> 3,962.6 gal. (> 15,000 liters)	2x IXU-4

Ion eXchange Element & Filter Elements

Ion eXchange Element	Part No.
IXE200	3348961
Replacement Filter Element *(prefilter & protection filter)*	**Part No.**
5.03.18D05BN/V SO103H	02077497
5.03.18D10BN/-V SO103H	Consult factory

One element for each filter required.

Order examples:

IXU- 4 -M-G-A -1-BM-Z /-PKZ requires:
4 x IXE200 element
2 x 5.03.18D10BN/-V SO103H *(for prefilter and protection filter)*

IXU- 4 -M-G-A -Z-BM-Z /-PKZ requires:
4 x IXE200 element
1 x 5.03.18D10BN/-V SO103H *(for protection filter only)*

IXU- 1 -M-G-A -1-BM-Z /-PKZ requires:
1 x IXE200 element
2 x 5.03.18D10BN/-V SO103H *(for prefilter and protection filter)*

Scope of delivery

- IXU with prefilter. Additional filter elements ordered separately.
- Operating manual

Please order Ion eXchange Elements separately.

Note: Ion eXchange Elements are not included with the IXU unit.

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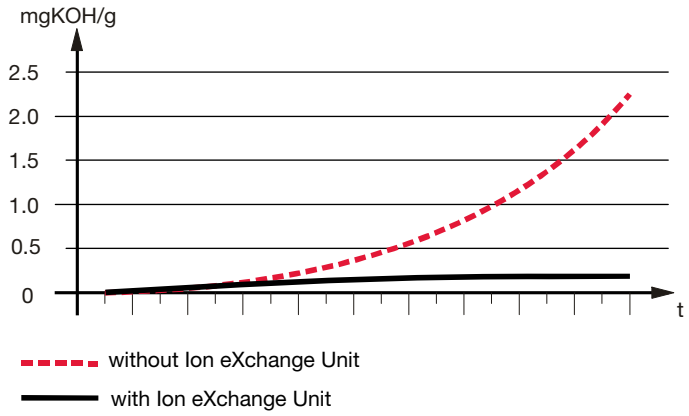
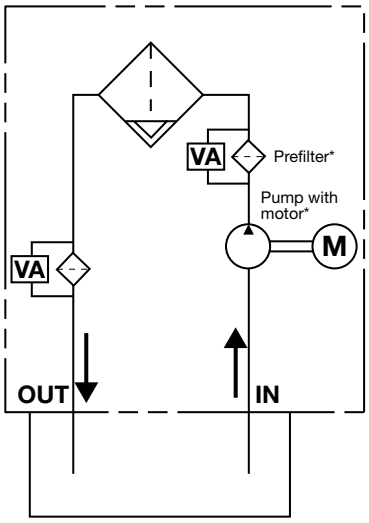
Performance

Example of acidification in HFD fluids with and without Ion eXchange Unit



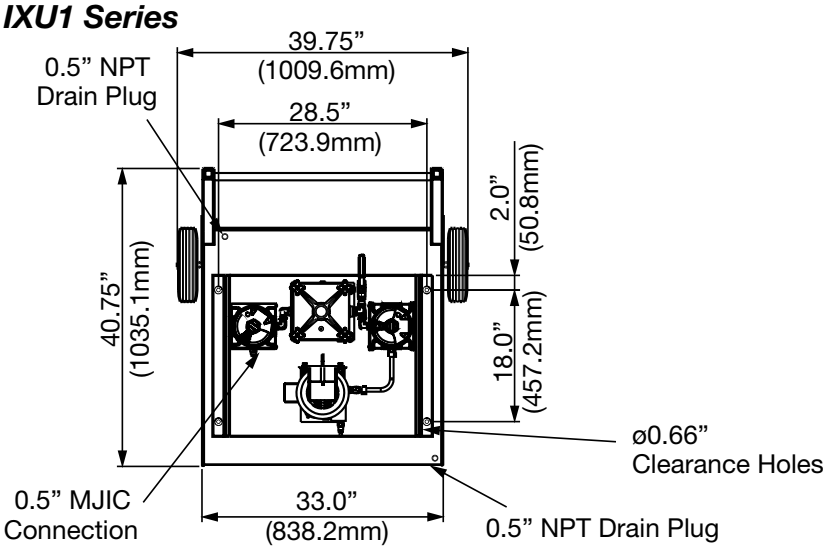
Hydraulic Symbol

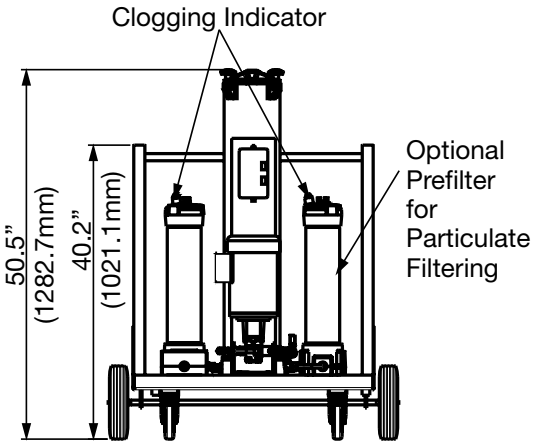


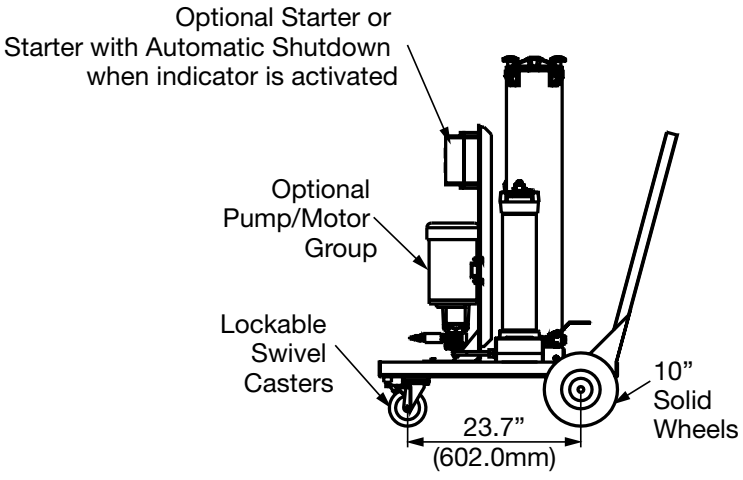
* optional equipment, see ordering details
VA = Clogging indicator

Dimensions

IXU1 Series







Dimensions are for general information only, all critical dimensions should be verified by requesting a certified print.

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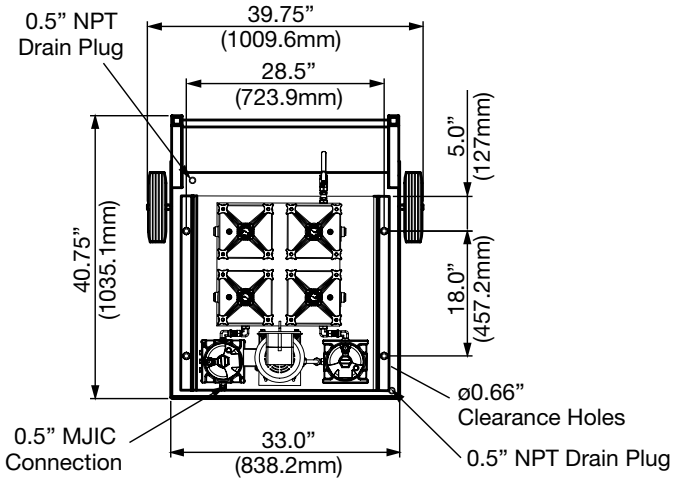
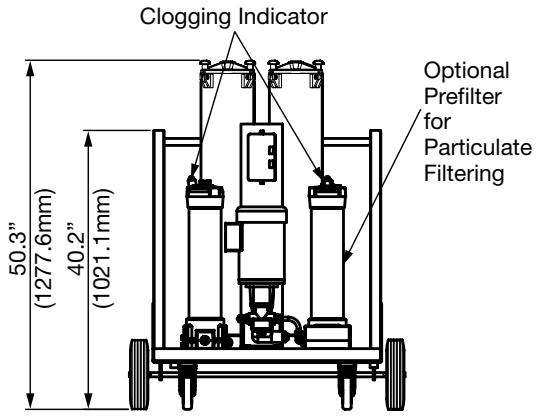
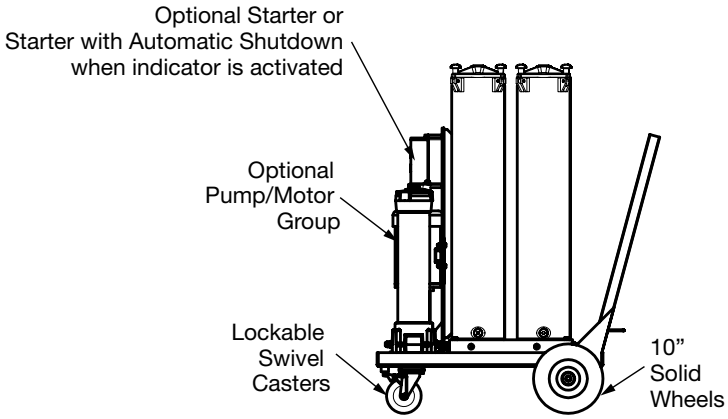
Dimensions
IXU4 Series







Dimensions are for general information only, all critical dimensions should be verified by requesting a certified print.

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MAFH Series
Dehydration Station

Description

Water contamination in hydraulic systems can severely reduce the life of hydraulic systems and fluids. The MAFH is designed to eliminate 100% of free and up to 90% of dissolved water from small reservoirs, barrels, and gear boxes. Using a patent pending transfer process, the MAFH efficiently removes water and particulate contamination quickly in all environments. A proprietary design reduces aeration of free and entrained gases of returned fluid. The unit was designed to be extremely portable using either the central lifting point or the optional cart to access tight areas.

Principle of Operation

The MAFH uses a new mass transfer dewatering technology. Ambient air is conditioned to increase its water holding capability before injecting to the reaction chamber. Fluid is equally distributed and cascaded down through reticulated media and the conditioned air stream. Water is transformed to water vapor and is expelled from the unit as a moist air stream. The relative humidity of the incoming fluid is continually monitored by an integral AS 1000 AquaSensor and displayed real-time on the control panel.

Applications

- Steel and rolling mills
- Pulp and paper plants
- Power generation plants
- Tool machines / Plastic machines
- Hydraulic operated presses
- Oil conditioning

Features

- High Dewatering Rates and particulate removal in one system
- Simple Controls; RUN/DRAIN modes
- Reduce fluid recycling cost
- No expensive vacuum pump to service and replace
- Patent Pending mass transfer technology uses ambient air to optimize and control dewatering rates
- Compact, efficient footprint - same diameter as a 55 gallon drum
- Remove free and disolved water
- Highly effective in low and high humidity elements

Technical Details

Dimensions	46”H x 23.25”OD
Fluid Viscosity	1000 SUS (216 cSt)
Weight	295 lbs (134 kg)
Inlet Connections	3/4” MJIC
Outlet Connections	1/2” MJIC
Flow Rate	90 gallons/hour
Inlet Pressure	Atmospheric
Outlet Pressure	to 40 psi
Fluid Service Temperature	50° F to 175°F (10°C to 79°C)
Power Supply	110 VAC, 60 Hz, 12 AMP
Attainable Water Content	< 50 ppm
Relative Humidity Display	Standard, 0-99% Range
Materials of Construction Base frame, vessel Seals	 Stainless steel FPM
Fluid Viscosity	Minimum – 70 SUS Maximum – 1000 SUS
Operating Fluids	Recommended for use with Hydraulic Fluids and Petroleum based Fluids; Consult factory for use with other fluid types
Maximum Recommended Hose Length/Diameter	At 70 SUS - 10 ft/0.75 (inlet) 15ft/0.5 (outlet) At 1000 SUS - 8ft/1.0 (inlet) 10ft/0.75 (outlet)
Maximum Suction Pressure	-0.4 bar (11.97 in Hg)

Element Performance

Micron Rating	Filter Rating	DHC (gm)
1	ß 4.2(c) ≥1000	55
3	ß 4.8(c) ≥1000	57
5	ß 6.3(c) ≥1000	62
10	ß 10(c) ≥1000	52
25	ß 24(c) ≥1000	48

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Model Code

MAFH - A - V - S - A - B - 01 - X

Series
MAFH = Dehydration station

Flow Rate
A = 1.5 gpm average

Seals
V = Fluoroelastomer (FPM)

Mobility
S = Stationary
M = Caster base

Voltage
A = 110V/60 Hz/1 Phase
B = 220 VAC 50 Hz

Air Source
B = Integral blower
C = Compressed air *(supplied)*

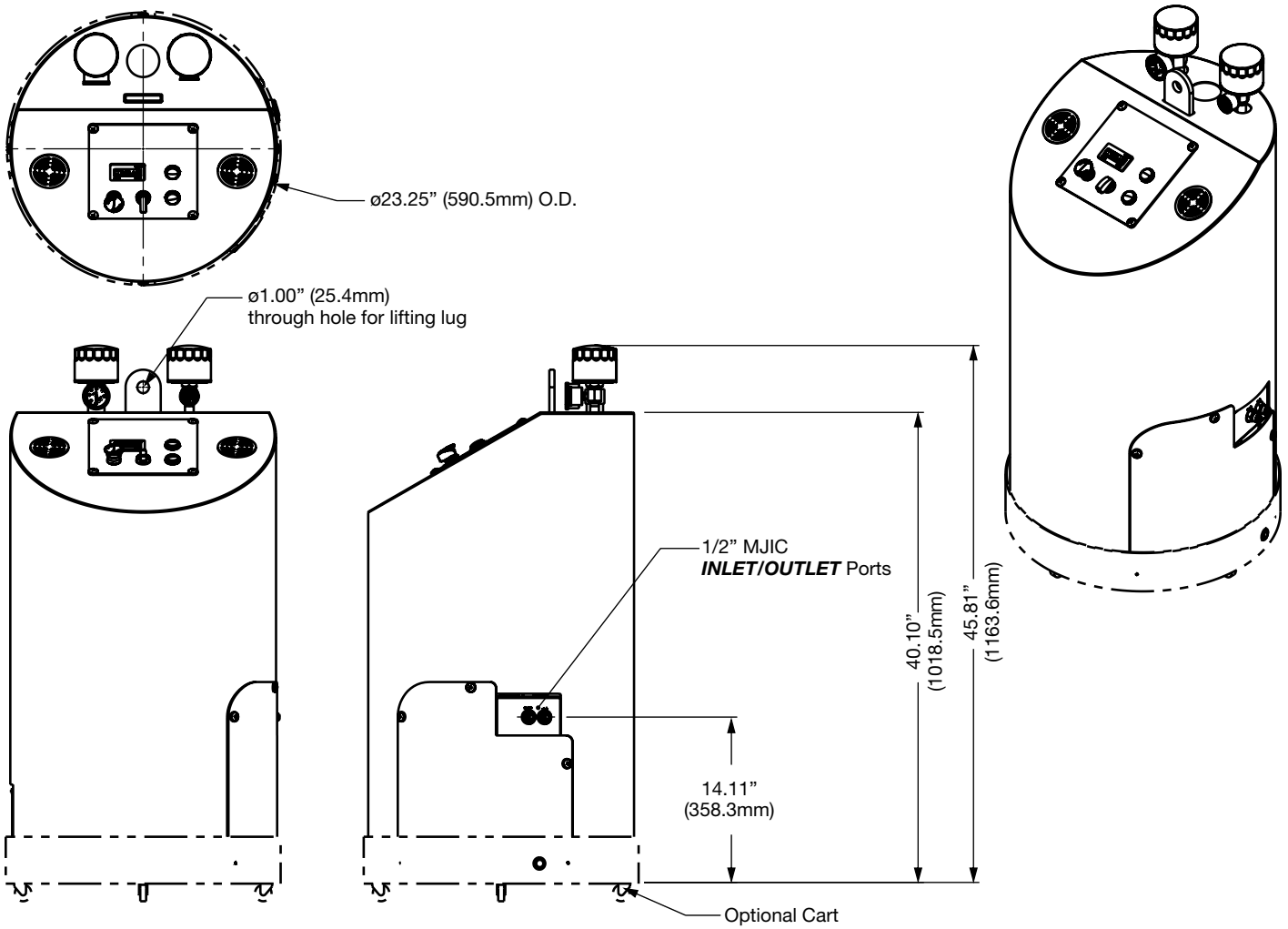
Element Size
01, 03, 05, 10, 25

Options
X = class 1, Div 2 explosion-proof *(contact factory if this option is required in for your application)*

For replacement element part numbers, please see page 69 of this catalog.

Model Codes Containing RED are non-standard items – Minimum quantities and longer lead times may apply - Contact HYDAC for information and availablity.

Dimensions



Dimensions are for general information only, all critical dimensions should be verified by requesting a certified print.

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MAFH-E Series
Dehydration Station

Features

- High Dewatering Rates and particulate removal in one system
- Simple Controls; RUN/DRAIN modes
- Reduce fluid recycling cost
- No expensive vacuum pump to service and replace
- Patent Pending mass transfer technology uses ambient air to optimize and control dewatering rates
- Remove free and disolved water
- Highly effective in low and high humidity

Description

Water contamination in hydraulic systems can severely reduce the life of hydraulic systems and fluids. The MAFH-E is designed to eliminate 100% of free and up to 90% of dissolved water from reservoirs, barrels, and gear boxes. Using a patent pending transfer process, the MAFH-E efficiently removes water and particulate contamination quickly in all environments. A proprietary design reduces aeration of free and entrained gases of returned fluid. The unit was designed to be extremely portable using either the integrated lifting lugs located on each corner of the cart or the optional wheeled cart.

Principle of Operation

The MAFH-E uses a new mass transfer dewatering technology. Ambient air is conditioned to increase its water holding capability before injecting to the reaction chamber. Fluid is equally distributed and cascaded down through reticulated media and the conditioned air stream. Water is transformed to water vapor and is expelled from the unit as a moist air stream. The relative humidity of the incoming fluid is continually monitored by an integral AS 1000 AquaSensor and displayed real-time on the control panel.

Technical Details

Dimensions	32” W x 59” L x 70.25” H
Dry Mass	Without Heater: 1050lbs; With Heater: 1230lbs
Inlet Connections	1-1/2” MJIC
Outlet Connections	1-1/4” MJIC
Oil Viscosity	Min 75 SUS; Max 2500 SUS
Flow Rate	900 gallons/hour
Inlet Pressure	Atmospheric
Outlet Pressure	To 100psi (6.9 bar)
Fluid Service Temperature	50°F to 160°F (10°C to 71°C)
Power Supply	460V/3/60Hz, 7 amps 460V/3/60Hz, 22.5 amps w/Heater 575V/3/60Hz, 5.5 amps 575V/3/60Hz, 18 amps w/Heater
Attainable Water Content	<50ppm
Relative Humidity Display	Standard, 0-99% Range
Construction	Base Frame: Carbon Steel Vessel: Stainless Steel Seals: Viton
Protection Class	NEMA-2

Element Performance

Micron Rating	Filter Rating	DHC (gm)
1	ß 4.2(c) ≥1000	55
3	ß 4.8(c) ≥1000	57
5	ß 6.3(c) ≥1000	62
10	ß 10(c) ≥1000	52
25	ß 24(c) ≥1000	48

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Model Code

MAFH - E - V - M - A - B - G05 - H

Series
MAFH = Dehydration Station

Flow Rate
E = 15gpm average

Seals
V = Fluoroelastomer (FPM)

Mobility
S = Stationary
M = Mobile

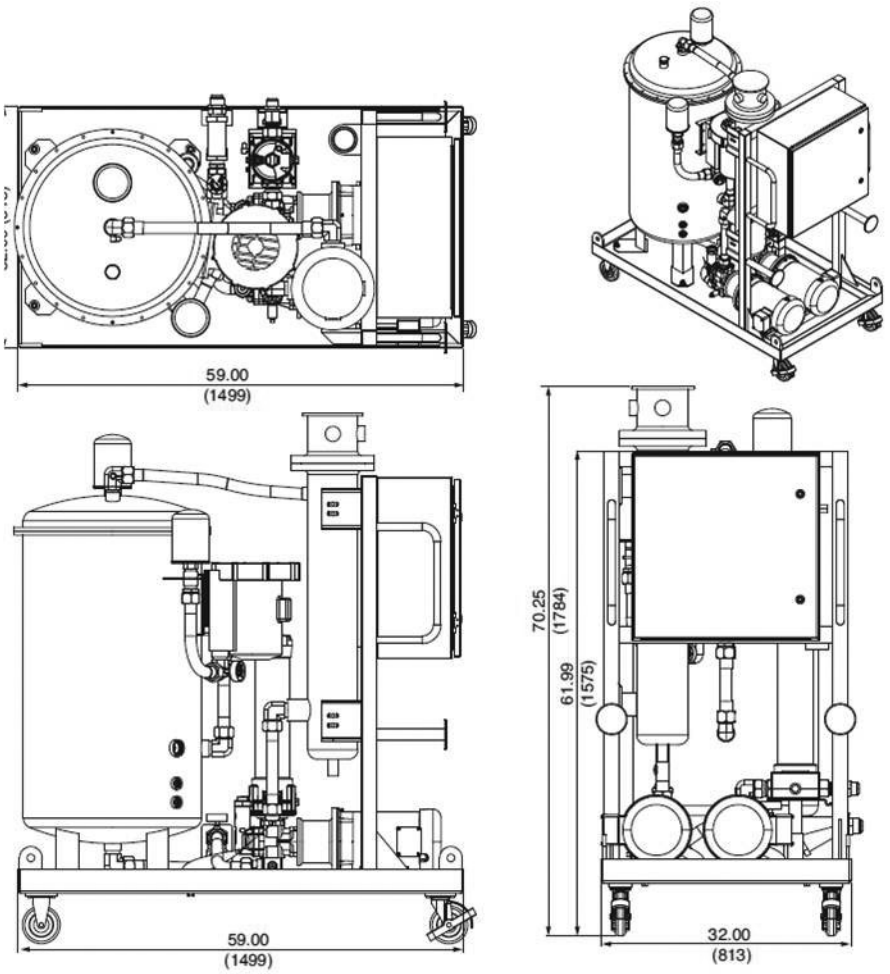
Voltage
A = 460V/3/60 Hz
B = 575V/3/60Hz

Air Source
B = Integral Blower

Element Size
G01, G03, G05, G10, G25

Optional Heater
H = 12500W Heater

Dimensions



Dimensions are for general information only, all critical dimensions should be verified by requesting a certified print.

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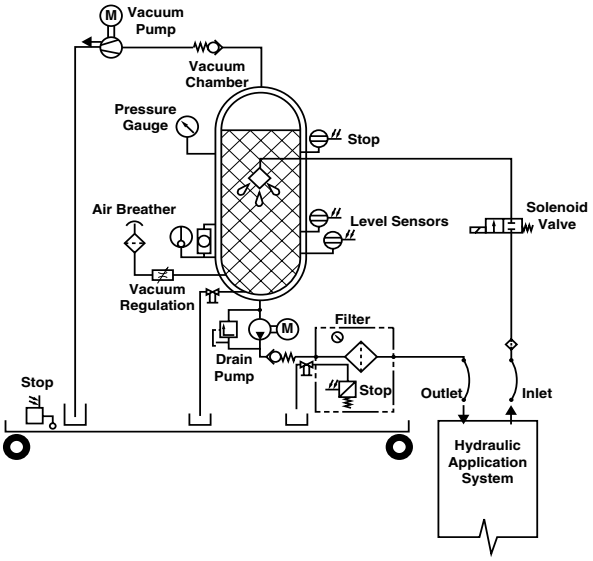
FAMH Series
Vacuum Dehydrator - Water & Solid Removal

Hydraulic Symbol



Description

The dewatering and filtration unit FAMH is a bypass unit which has been specially designed for the conditioning of lubrication and hydraulic fluids. Use of HYDAC's Dimicron® filter element technology provides a high contamination retention capacity.

The FAMH has been redesigned to include a touch screen menu for ease of diagnostics.

Advantages

- Nema 12 Standard
- Separation of 100% free and 90% dissolved water through vacuum dehydration
- Removal of 100% free and 95% dissolved gases
- Separation of particles with high contamination retention capacity
- Easy handling and automatic supervision of the PLC controlled process
- User friendly touch screen diagnostics
- Standard aquasensor provides % water saturation
- JIC connections

Applications

- Steel and rolling mills
- Pulp and paper plants
- Power generation plants
- Tool machines / Plastic machines
- Hydraulic operated presses
- Oil conditioning

Options

- Nema 4 Enclosure

HYDAC FAMH vs Other

- Water removal below saturation point
- Static flow through the filter
- Optimal particle removal efficiency
- Removed water is used to seal the vacuum pump *(Vacuum Pump type S, SW only)*
- The special vacuum pump concept avoids any dangerous chemical reaction products *(Vacuum Pump type S, SW only)*
- No corrosion within the vacuum pump
- No oil mist with standard watering / vacuum pump
- Serviceable vacuum chamber
- Low operating costs
- User friendly on screen operational and maintenance instructions

The contamination of hydraulic fluids with water can either be caused by condensation or by ingression. Variations in temperature of the hydraulic tank lead to condensation. The ingression of water can be caused by defective cooler hoses, defective seals or external leakages into the system.

In lubrication and hydraulic fluids water can occur in two different forms:

- free water *(visible)*
- dissolved water *(not visible)*

Aquamicron® elements, centrifuges and condensation methods normally only separate free water, the FAMH separates both forms of water from the oil. While dewatering the fluid, dissolved gases are also removed. Thereby the lubricating properties are improved which extends oil life, reduces component wear rates, and eliminates production losses caused by breakdowns.

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Model Code

FAMH 30 M 2 O / 2700 030 DM 02 S A 1*

Series
FAMH = Fluid Aqua Mobile

Flow Rate
15 = 5 gpm
30 = 10 gpm
50 = 16 gpm
70 = 23 gpm

Operating Fluid
M = Mineral Oils *(including Oils with max. viscosity as identified in Technical Data)*
I = Transformer Oil *(heater required)*
X = Synthetic & Fire Resistant Oil *(please specify exact fluid type)* - FPM seals

Type
1 = Stationary
2 = Mobile

Voltage/Frequency
F = 230 V / 60 Hz / 3Ph+PE
O = 460 V / 60 Hz / 3Ph+PE
N = 575 V / 60 Hz / 3Ph+PE

Power

without heater		with heater	
1900	= 1900 W *(FAMH 15)*	8650	= 8650 W *(FAMH 15)*
2700	= 2700 W *(FAMH 30)*	19200	= 19200 W *(FAMH 30)*
3200	= 3200 W *(FAMH 50)*	21200	= 21200 W *(FAMH 50)*
5100	= 5100 W *(FAMH 70)*	26100	= 26100 W *(FAMH 70)*

Filter Size *(microns)* **& Number of Elements**
015 = 1 x N15DMxx *(FAMH 15 only)*
030 = 2 x N15DMxx *(FAMH 15 and 30 only)*
045 = 3 x N15DMxx *(FAMH 15, 30 and 50 only)*
060 = 4 x N15DMxx *(FAMH 15, 30 and 50 only)*
075 = 5 x N15DMxx *(FAMH 70 only)*

Filter Material
DM = Dimicron®

Absolute Filtration Rating *(micron)*
02 = 2 µm (DM)
10 = 10 µm (DM)
20 = 20 µm (DM)
30 = 30 µm (DM)

Vacuum Pump Type/Size
D = Rotary vane pump
S = Standard watering / vacuum pump

Measuring Equipment
A = AquaSensor *(standard)*

Modification Number *(latest version always supplied)*
1
SW = Automatic Water Fill

Note: Please consult factory for NEMA4 enclosure.

Model Codes Containing RED are non-standard items – Minimum quantities and longer lead times may apply - Contact HYDAC for information and availablity.

***Sample Model Code** *(top of the page)* **is a standard version.**
FAMH 30 M 2 O / 2700 030 DM 02 D A 1 - Standard FAMH without a heater
FAMH 30 M 2 O / 19200 030 DM 02 D A 1 - Standard FAMH with a heater

For replacement element part numbers, please see page 69 of this catalog.

For special models, please contact our sales/technical department *See next page for factors that affect water removal rate

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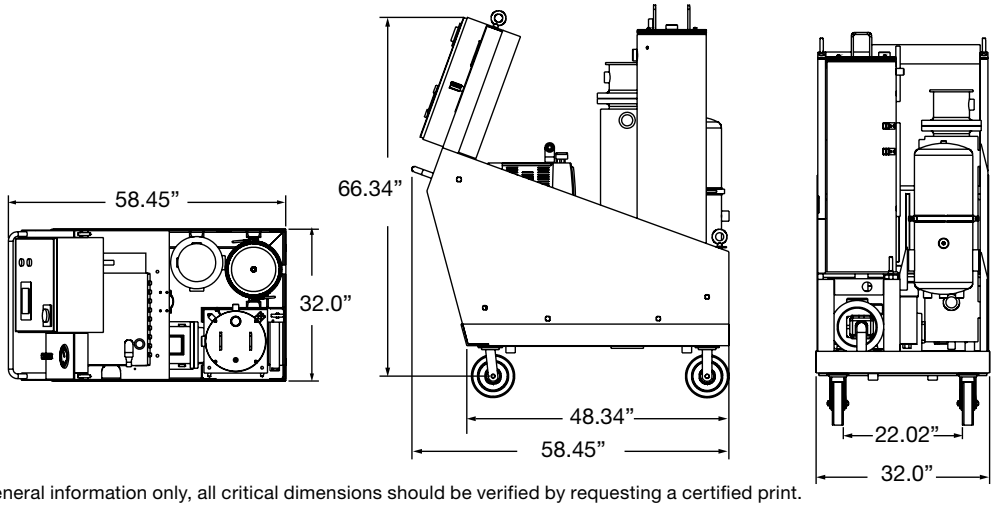
Technical Details

Series	FAMH 15	FAMH 30	FAMH 50	FAMH 70
Filter Size	OLF-15	OLF-30	OLF-45	OLF-70
Filter Element	N15DMxxx(1x)	N15DMxxx(2x)	N15DMxxx(3x)	N15DMxxx(5x)
Capacity of Pressure Vessel gal (liters)	5.25 (20)	10.5 (40)	20.5 (78)	26.25 (100)
Approx. Solid Contamination removal to ISO 4572 lbs (g)	1.1 (500)	2.2 (1000)	3.3 (1500)	5.5 (2500)
Electric Clogging Indicator	VM 2C.x			
Bypass Cracking Pressure psi (bar)	29 (2)			
Pump Type	Gear pump			
Flow rate gpm	5	10	16	23
Maximum Operating Pressure psi (bar)	87 (4.5)			
Viscosity Range (without) SUS (cst)	75-2500 (15-500)			
Electrical Cable Length ft (m)	32 (10)			
Hose Length ft (m)	16 (5)			
Hose Material	NBR			
Inlet - Outlet	JIC 20 (1 1/4") - JIC 16 (1")			
Seal Material (FPM for operating fluid B, X)	NBR			
Dry Weight (lbs.)	940	970	1100	1145
Fluid Temperature	50° to 175°F			
Ambient Temperature	5° to 105°F			
Approx. Max. Free Water Removal Rate* (gallons/hour)	0.75	1	1.5	2
Attainable water content (ppm)	< 100 ppm			
Power Requirements	60 AMP Circuit Required			

Dimensions



Dimensions are for general information only, all critical dimensions should be verified by requesting a certified print.

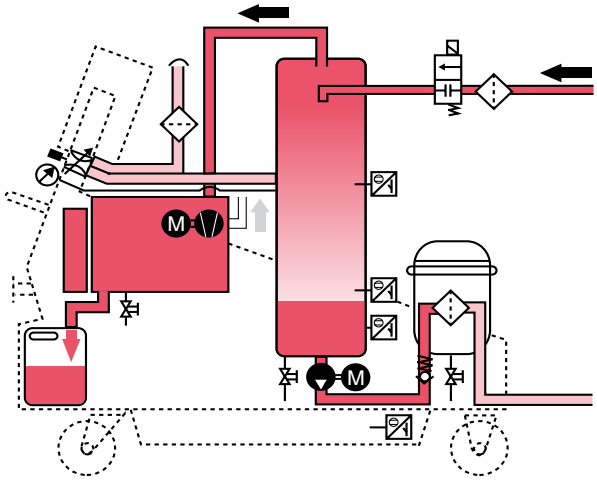
Water Extraction Process

(for FAMH 15 - 70 without heater only)

The operating fluid is drawn from the oil reservoir by the vacuum in the reactor through the suction strainer and the shut-off valve. The oil trickles down slowly and from there is fed back into the oil reservoir by the gear pump through the filter. When Dimicron filter element technology is used the unit is especially economical.

Water is removed from the fluid in the reactor. The vacuum present has the effect of reducing the boiling point of the water.

The water vapor is released into the atmosphere or the water reservoir through the vacuum pump.



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Negative Effects of Water on Oils

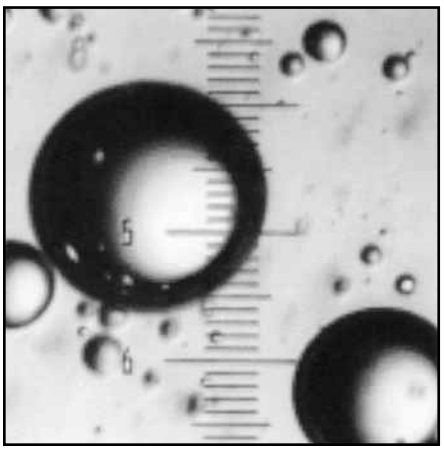
It is almost certain that there is water in a hydraulic system. The most frequent causes are: ambient humidity, splash water, and new oil. Mineral based oils show a faster aging process, if there is water in the oil. This aging process is accelerated through contamination particles by a catalytic effect. The additives are quickly used up and the lifetime of the operating fluid is much shorter than that of “dry” oil.

Water in Mineral Oil causes

- Ageing of the fluid
- Fluid deterioration
  - Reduced air separating — results in: Cavitation
  - Increased foaming — results in: Cavitation
  - Reduced lubrication — results in: Vibration & Wear
  - Erratic operation — results in: Inaccuracy
- Depletes additives
- Clogged filters
- Corrosion

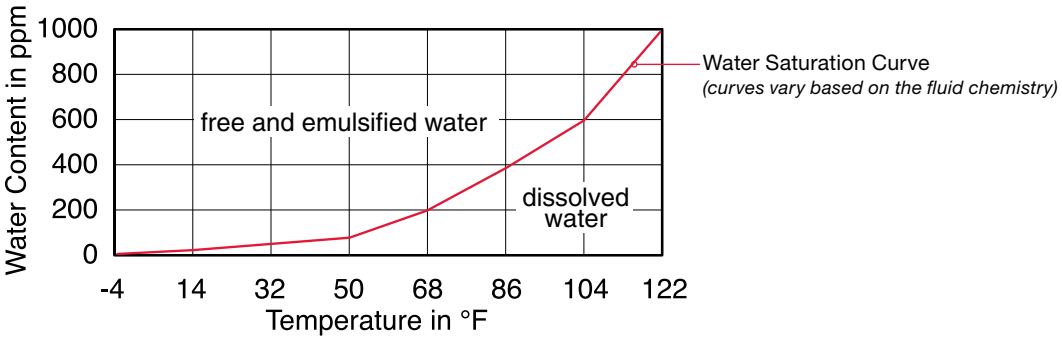
Water in Ester Oils causes:

- Hydrolysis
- Seal deterioration
- Leakage



Tiny water droplets in hydraulics fluid
(i unit equals 10 micron)

Typical Saturation Limit of Hydraulic Oil for Water



FAMH Sizing

Sizing of the FAMH is normally done through periodic measuring of the water content which will determine the hourly ingression of water. The typical dewatering speed of the FAMH is listed in the technical data table. If there is a continuous ingression of water the recommended flow rate of the FAMH can be determined by the system size *(total gallons)*. It should circulate 3 or 4 times through the FAMH every day.

Sizing Chart Limits

(continuous water ingression)

Tank Volume (gallons)	FAMH Model
1000 to 2000	FAMH 15
2000 to 4000	FAMH 30
4000 to 7000	FAMH 50
7000 and up	FAMH 70

*Please note that the fluid temperature should be a minimum of 20°F warmer than the ambient air temperature to enable efficient dewatering. An inline heater is available for reclaim applications. Please contact our sales/technical department.

Factors That Affect Water Removal Rate

	Factor (increasing/decreasing)	Dewatering Speed
Water Content	↑	↑
Fluid Temperature*	↑	↑
Detergent Additives		↓
Absolute Pressure in Vacuum Chamber	↓	↑
Humidity	↓	↑
FAM Flow Rate	↑	↑
Ester Oils		↘

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Pressure Elements

Used in OFS Series, OFCS & OFCD Series, OFAS & OFAD Series, OF5HS & OF5HD Series, and OFX Skid - Standard Capacity Series

9 inch Elements		18 inch Elements		27 inch Elements	
Model Code	Part No.	Model Code	Part No.	Model Code	Part No.
5.03.09D03BN	02060528	5.03.18D03BN	02060430	5.03.27D03BN	02065003
5.03.09D03BN/-V	02056713	5.03.18D03BN/-V	02071680	5.03.27D03BN/-V	02082855
5.03.09D05BN	02060529	5.03.18D05BN	02060431	5.03.27D05BN	02065004
5.03.09D05BN/-V	02056714	5.03.18D05BN/-V	02056457	5.03.27D05BN/-V	02073488
5.03.09D10BN	02060530	5.03.18D10BN	02060432	5.03.27D10BN	02065005
5.03.09D10BN/-V	02056715	5.03.18D10BN/-V	02056492	5.03.27D10BN/-V	02056493
5.03.09D20BN	02060531	5.03.18D25BN	02060433	5.03.27D20BN	02065006
5.03.09D20BN/-V	02056716	5.03.18D25BN/-V	02072428	5.03.27D20BN/-V	C/F
5.03.09D10AM	02075265	—	—	5.03.27D40AM	02088358
HK/HJ *(connector element)*	02056730	—	—	—	—

Used in OFX Skid - High Capacity Replacement Elements

16 inch Element		39 inch Element	
Model Code	Part No.	Model Code	Part No.
1.14.16D03BN	02060578	1.14.39D03BN	02060844
1.14.16D03BN/-V	02078420	1.14.39D03BN/-V	02070809
1.14.16D06BN	02060588	1.14.39D06BN	02060845
1.14.16D06BN/-V	C/F	1.14.39D06BN/-V	C/F
1.14.16D12BN	02060589	1.14.39D12BN	02060846
1.14.16D12BN/-V	C/F	1.14.39D12BN/-V	02071197
1.14.16D25BN	02060590	1.14.39D25BN	02060847
1.14.16D25BN/-V	02078423	1.14.39D25BN/-V	C/F

Used in OFX Skid - High Capacity Coreless Replacement Elements

16 inch Element		39 inch Element	
Model Code	Part No.	Model Code	Part No.
5.31.16D03ECO/C	C/F	5.31.39D03ECO/C	C/F
5.31.16D03ECO/C/V	02086776	5.31.39D03ECO/C/V	C/F
5.31.16D05ECO/C	C/F	5.31.39D05ECO/C	C/F
5.31.16D05ECO/C/V	02086777	5.31.39D05ECO/C/V	C/F
5.31.16D10ECO/C	C/F	5.31.39D10ECO/C	C/F
5.31.16D10ECO/C/V	02086778	5.31.39D10ECO/C/V	C/F
5.31.16D20ECO/C	C/F	5.31.39D20ECO/C	C/F
5.31.16D20ECO/C/V	02086779	5.31.39D20ECO/C/V	C/F

Dimicron® Elements

Used in OLF Series, & FAMH Series

Model Code	Micron Rating	Part No.
N15DM002	2	01251590
N15DM010	10	03115180
N15DM020	20	00349576
N15DM030	30	03048790

Be sure to order the correct number of elements:
OLF 15 = 1, OLF 30 = 2, OLF 45 = 3, OLF 60 = 4

Cartridge and Spin-on Elements

Used in OLF Compact Series

Model Code	Micron Rating	Media Type	Part No.
N5DM002*	2	Dimicron®	00349494
N5DM005*	5	Dimicron®	03068101
N5DM010*	10	Dimicron®	03102924
N5DM020*	20	Dimicron®	03023508
N5AM002*	2	Aquamicron®	00349677
N5AM020*	20	Aquamicron®	03040345
180MA020BN**	20	Betamicron®	02059441

*Cartridge element can not be used with OLF 5/4-SP
**Spin-on element for OLF 5/4-SP only

Ion eXchange and Replacement Elements

Used in IXU 1/4 Series

Model Code	Part No.
IXE 200	03348961
5.03.18D05BN/V SO103H	02077497
5.03.18D10BN/-V SO103H	C/F

Replacement Element

Used in MAFH Series

Model Code	Part No.
5.12.09D10BN/-V	02561354
5.12.09B03BN/-V	02093367
5.12.09B05BN/-V	02091885
Breather Element	02561357

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Portable Filtration Units

Used in OF7 Series

Model Code

0160MA BN 003

Size
0160MA = size 160 spin-on element *(OF7 only)*

Media Type
BN = Betamicron®
A = Aquamicron®
P = Paper

Micron Rating
003 = 3 µm
005 = 5 µm
010 = 10 µm
020 = 20 µm
025 = 25 µm

NOTE: Not all combinations are available.Refer to product model code charts to see which combinations are available for each.

Aquamicron® (AM)

Aquamicron® filter elements are specially designed to separate water from mineral oils. They are only supplied in the dimensions of HYDAC return line filter elements from size 330 and larger. This means that they can be installed in all HYDAC filter housings from size 330 which are fitted with return line filter elements.

The increasing pressure loss in a filter element which is being saturated with water indicates, by means of standard clogging indicators, that it is time to change the element. When the Aquamicron® technique is employed, particle contaminants are also separated from the hydraulic medium as a by-product. This means that the Aquamicron® element doubles as a safety filter. The "filtration rating" is 40 µm absolute (β40 ≥ 100 to Δp = 3 bar).

In order to guarantee the greatest efficiency, it is recommended that these elements be installed in an off-line recirculation loop configuration.

For complete details please contact your HYDAC distributor.

Betamicron® / Aquamicron® (BN/AM)

BN/AM filter elements are specifically designed to absorb water and achieve absolute filtration of solid particles from mineral oils, HFD-R oils, and rapidly biodegradable oils. A super absorber reacts with the water present in the fluid and expands to form a gel from which the water can no longer be extracted even by increasing the system pressure. These filter elements do not remove dissolved water below the saturation level of the hydraulic medium. Solid particle filtration (3 µm, 10 µm absolute) is achieved due to the Betamicron® filter construction.

For complete details please contact your HYDAC distributor.

Interchange Elements

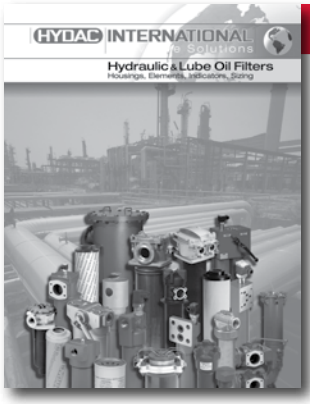
HYDAC Betafit® Filter Elements

Exceptional Performance — Superior Stability.

HYDAC offers a complete range of interchange elements for all major manufacturers. To quickly and easily search for an interchange for any manufacturer, please visit:

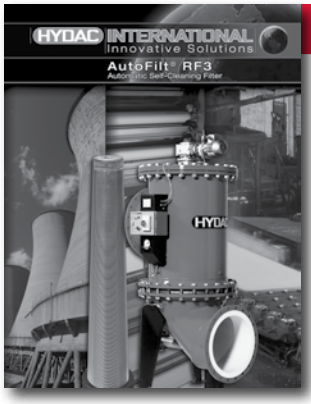
www.hydacusa.com/betafit

www.comoso.com



Hydraulic & Lube Oil Filters

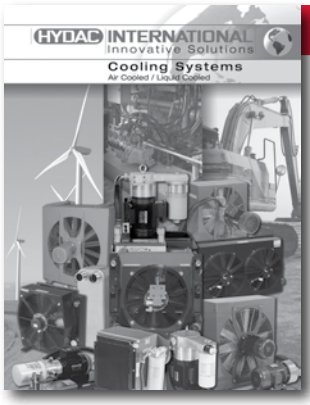
- Inline Filters
- Inline Duplex Filters
- In-Tank Filters
- In-Tank Inline Duplex Filters
- In-Tank Return Line Filters
- In-Tank Suction Filters
- Inside Tank Filters
- Manifold Mount Filters
- Modular Stacking Filters
- Manifold Cartridge Filters
- Low, Med. & High Press. Filters
- Filter Elements
- Clogging Indicators



Process Filtration

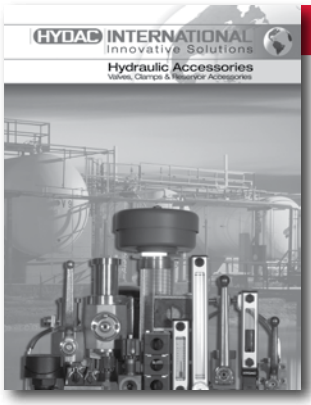
The AutoFilt® RF3 is an automatic self-cleaning filtration system designed for continuous maintenance free filtration of water.

- 20 - 31,000 gpm flow rates
- 2” - 36” ANSI flange sizes
- 25 - 3000 micron ratings
- 25 to 150 psi operating pressures
- ASME Code certification
- Electric, Pneumatic, or
- Electro-pneumatic power source



Cooling Systems

- Air Cooled Oil Coolers
- Air Cooling Systems for Water Glycol
- Air Cooled Oil Coolers for Mobile Applications
- Pump/Filter/Cooler Units
- Heat Exchangers
- Accessories
  - Adjustable Temperature Switches
  - Thermostatic Bypasses
  - Integrated Bypasses
  - Compatible Filters
  - Compatible Clogging Indicators



Hydraulic Accessories

Valves

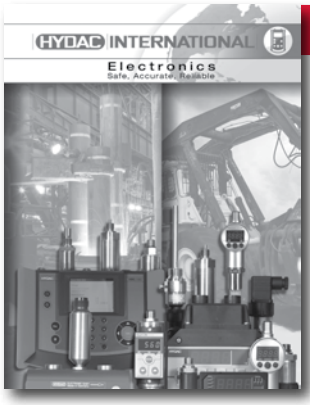
- High & Low Press. Ball Valves
- Flow Control Valves
- Hose Break Valves
- Metric Cartridge Valves

Clamps

- DIN 3015 Clamps
- Standard Clamps
- Custom Solutions

Accessories

- Breathers & Filler Breathers
- Fluid Level Indicators
- Suction Strainers
- Gauge Isolators
- TestPoints



Electronics

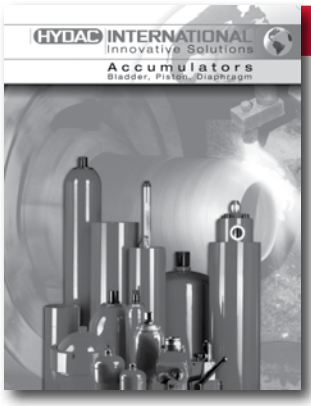
- Pressure Transducers
- Special Environment Transducers
- Pressure Switches
- Display Units
- Temperature Transducers
- Temperature Switches
- Level Sensors
- Flow Sensors
- Diagnostic Equipment
- Adapters
- Connectors
- Mounting Kits
- Demonstration Kits

Mobile Hydraulics

- Sectional & Monoblock Configurations
- Manual, Hydraulic Pilot, Electro Hydraulic, Pneumatic Actuators
- Nominal flow - 14 to 42 gpm
- Maximum Pressure 5000 psi
- Special configurations to help you control fixed or variable displacement pumps
- Custom solutions in a single all-inclusive package
- Special adapted spool configurations according to your needs

Cartridge Valves & Manifolds

- Pressure Control Valves
- Pressure Relief Valves
- Pressure Reducing/ Relieving Valves
- Flow Control & Regulator Valves
- Check Valves
- Counterbalance Valves
- Solenoid Control Valves
- Directional Control Valves
- Proportional Valves
- Solenoid Coils
- Line Bodies & Form Tools
- Manifold Accessories
- Seal Kits & Adjustment Kits



Accumulators

- Bladder Accumulators
- Diaphragm Accumulators
- Piston Accumulators
- Nitrogen Bottles
- Pulsation Dampeners
- Thermal Fuse Caps
- Safety & Shut-off Blocks
- Charging & Gauging Units
- Permanent Gauging Blocks
- Mounting Components
- Sizing Information
- Spare Parts, Seal Kits & Tools

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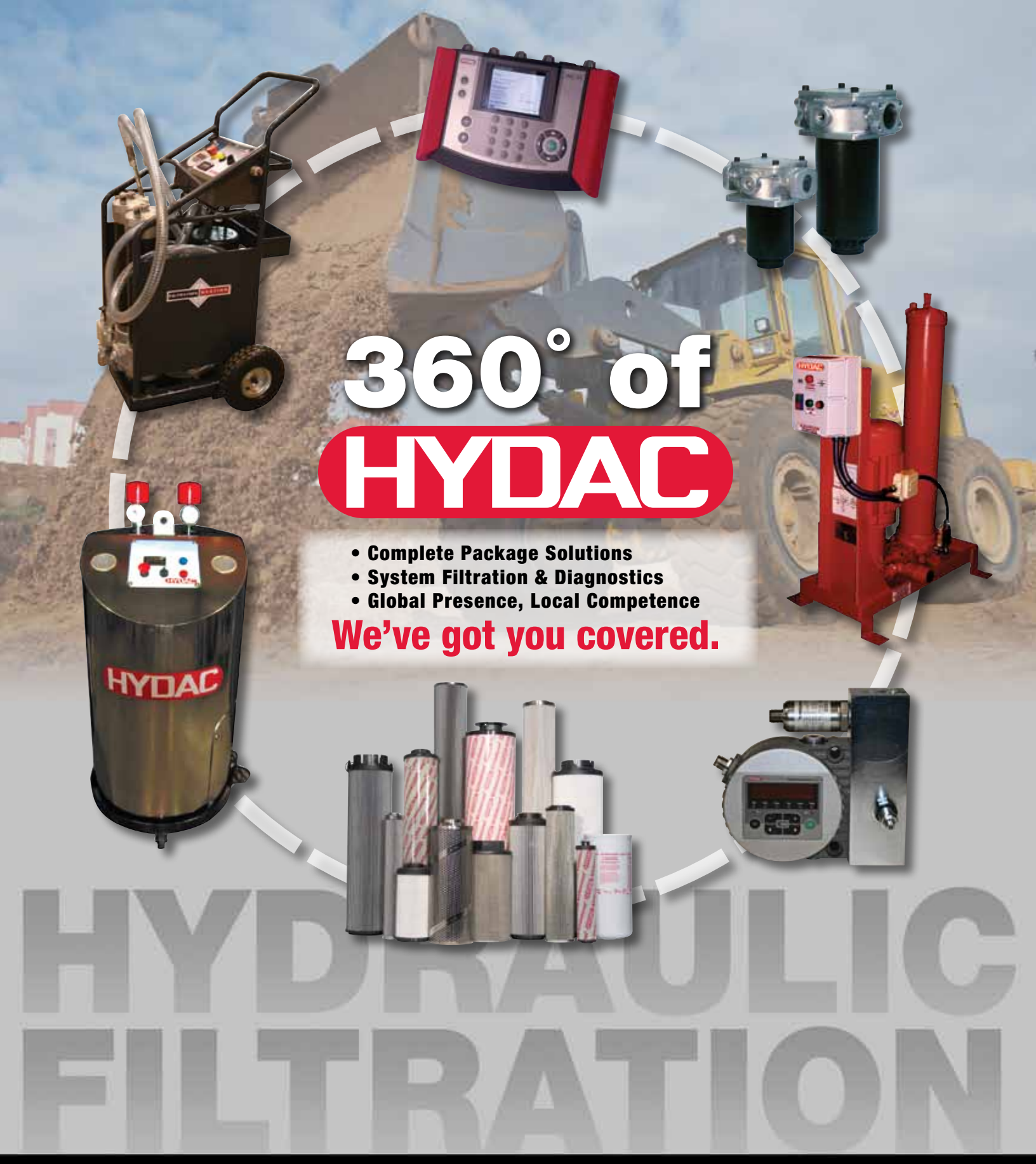

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1.888.99.HYDAC | www.HYDAC.ca

www.comoso.com

HYDAC INTERNATIONAL

INNOVATIVE FLUID POWER

Global Head Office
HYDAC INTERNATIONAL GMBH

Industriegebiet
66280 Sulzbach/Sarr
Germany

Tel.: +49 6897 509-01

Fax: +49 6897 509-577

Internet: **www.hydac.com**
Email: info@hydac.com

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HYDAC USA

www.HYDACusa.com

HYDAC TECHNOLOGY CORPORATION
HYCON Division,
Filter Division,
Electronic Division

2260 City Line Road
Bethlehem, PA 18017

+1.610.266.0100

HYDAC TECHNOLOGY CORPORATION
Hydraulic Division
Compact Hydraulic Division

450 Windy Point Drive
Glendale Heights, IL 60139

+1.630.545.0800

HYDAC TECHNOLOGY CORPORATION
Cooling System Division

445 Windy Point Drive
Glendale Heights, IL 60139

+1.630.545.0800

HYDAC CORPORATION
HYDAC TECHNOLOGY CORPORATION
Mobile Hydraulic Division
Sales Office

1660 Enterprise Parkway • Suite E
Wooster, OH 44691

+1.610.266.0100 x1902

HYDAC CORPORATION
HYDAC TECHNOLOGY CORPORATION
Sales Office

12606 NE 95th Street
Building VC, Suite 100
Vancouver WA 98682

+1.360.882.0977

HYDAC CORPORATION
Accumulator Division

2204 Avenue C
Bethlehem, PA 18017

+1.610.266.0100

HYDRO POWER
HYDAC Cylinders LLC

540 Carson Road N
Birmingham, AL 35217

+1.205.520.1220

HYDAC TECHNOLOGY CORPORATION
Cooling System Division

3539 Denver Drive
Denver, NC 28037

+1.610.266.0100 x1805

HYDAC CORPORATION
HYDAC TECHNOLOGY CORPORATION
Sales Office

1718 Fry Road • Suite 100
Houston, TX 77084

+1.281.579.8100

HYDAC CORPORATION
HYDAC TECHNOLOGY CORPORATION
Sales Office

9836-B Northcross Center Court
Huntersville, NC 28078

+1.610.266.0100 x1803

HYDAC Canada

www.HYDAC.ca

HYDAC CORPORATION

14 Federal Road
Welland, Ontario, Canada L3B 3P2

+1.905.714.9322

HYDAC CORPORATION
Sales Office

Montreal, Québec, Canada J2M 1K9

+1.877.539.3388

HYDAC CORPORATION
Sales Office

101 - 18207 114 AVE W
Edmonton, Alberta, Canada T5S 2P6

+1.780.484.4228

HYDAC Mexico

www.HYDACmex.com

HYDAC INTERNATIONAL SA DE CV

Av. Industria No. 102 Nave V
Los Reyes Ixtacala Tlalnepantla De Baz
Edo. de Mexico, Mexico 54090

+52.5.55565.8511

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